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INDUSTRIAL WASTE SURVEY REPORT. INTERNATIONAL PAPER COMPANY, SOUTHERN KRAFT DIVISION PULP AND PAPER MILL, PANAMA CITY, FLORIDA. A STUDY OF THE CHARACTERISTICS OF THE INDIVIDUAL AND COMBINED WASTES OF A KRAFT PULP AND PAPER MILL, MARCH 17 TO APRIL 10, 1952

Virgil A. Minch

Environmental Health Center
Cincinnati, Ohio

1952

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INDUSTRIAL WASTE SURVEY REPORT

INTERNATIONAL PAPER COMPANY
Southern Kraft Division
Pulp and Paper Mill
Panama City, Florida

March 17 to April 10, 1952

A Study of the Characteristics of the Individual and Combined Wastes of a Kraft Pulp and Paper Mill

By
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U. S. DEPARTMENT OF
HEALTH, EDUCATION, AND WELFARE
PUBLIC HEALTH SERVICE
ENVIRONMENTAL HEALTH CENTER

104

CONTENTS

	Page
ABSTRACT	1
GENERAL INFORMATION	5
1. Organization of Survey	5
2. Period of Survey	5
3. Personnel	5
4. Purpose	6
5. Location of Plant	7
6. Production	7
7. Raw Materials	8
9. Water Supply	9
10. Waste Disposal	9
PULP MANUFACTURING PROCESS	9
11. Log Handling and Chipping	10
12. Digestion	10
13. Pulp Washing	12
14. Screening	13
15. Chemical Recovery	13
PAPER MANUFACTURING PROCESS	17
16. Pulp Preparation	17
17. Sheet Formation	17
SURVEY PROCEDURES	20
18. Sample Collection	20
19. Flow Measurements	21
20. Laboratory Analyses	25
EXPLANATION OF LABORATORY DETERMINATIONS	26
21. Immediate Oxygen Demand	26
22. Biochemical Oxygen Demand	26
23. Oxygen Consumed	27
24. Acidity	27
25. Alkalinity	28
26. pH	28
27. Color	28
28. Lignins and Tannins	28
29. Sulfides	29
30. Chlorides	29
31. Solids	29

	Page
RESULTS	30
32. Quantity of Liquid Wastes Discharged	51
33. Quantity of Significant Constituents	53
34. Waste Constituents per Unit Production	55
APPENDIX	58
Dichromate Reflux Method for Determination of Oxygen Consumed	59
Data Summary Sheets	61-97

FIGURES

Fig. 1	Pulp Mill Flow Diagram	16
Fig. 2	Paper Mill Flow Diagram	19
Fig. 3	Waste Disposal System	22

TABLES

No. 1	Average Volume and Concentration of Component Waste Constituents	31-32
No. 2	Average Quantity of Component Waste Constituents	33-34
No. 3	Average Quantity and Percentage of Waste Constituents of Each Component of Evaporator Condenser Salt Water and Turpentine Surface Condenser Cooling Water	36
No. 4	Average Quantity of Waste Constituents in Wood Yard Sewer Due to Log Conveying	38
No. 5	Average Quantity and Percentage of Waste Constituents of Components of Total Pulp Mill Effluent	41
No. 6	Average Quantity and Percentage of Waste Constituents of Each Component of the Tall Oil and Cinder Pond Effluent	43
No. 7	Average Quantities of Constituents of Component Wastes and Bayou Chico Effluent	45-46

Page

TABLES

No. 8	Average Quantity and Percentage of Waste Constituents of Each Component of the Salt Water Ditch	48
No. 9	Net Values of Significant Constituents of Total Waste Components	50
No.10	Maximum, Minimum, Average, and Percentage Flow of Each Component of Total Waste Discharge	52
No.11	Total Pounds of Constituents Discharged Daily	54
No.12	Quantity of Waste Constituents per ton of Paperboard Produced	56

ABSTRACT

This survey was undertaken as part of the U. S. Public Health Service program of industrial waste studies for the purpose of determining volume and characteristics of liquid wastes resulting from various manufacturing processes. The primary objectives of this study were to obtain original and additional data to supplement existing information on individual and combined wastes of a kraft pulp and paper mill. Information obtained from this study is to be combined in an unidentifiable manner with data obtained from similar mills in the preparation of an industrial waste guide.

The Southern Kraft Division of International Paper Company operates a plant at Panama City, Florida, which produces pulp by the kraft or sulphate process from various species of southern pine wood. The entire pulp production is subsequently made into paperboard on two 235 inch Fourdrinier paper machines which have a total average capacity of about 1300 tons per day.

During the course of the survey, liquid wastes from the mill manufacturing processes and from the steam-electric power plant were collected and analyzed under the following designations:

Evaporator condenser effluent (salt water)
Turpentine surface condenser cooling water (salt water)
Wood yard sewer
Pulp mill effluent
Caustic room effluent
Recovery room effluent
Turpentine separator underflow
Crude tall oil plant and cinder pond effluent
Paper mill effluent
Combined mill effluent (Bayou Chico effluent)
Power plant effluent (salt water)

Samples of the liquid wastes from the Arizona Chemical Company which are discharged to the International Paper Company salt water ditch were also

SOURCES OF LIQUID WASTES AND AVERAGE RESULTS OF THE MORE SIGNIFICANT CONSTITUENTS

Waste Designation	Source of Waste or Explanation	Discharge MGD	Discharge Gallons per ton of Paperboard Production	B.O.D., 5-Day-20°C. ppm	B.O.D., 5-Day-20°C. Pounds per ton of Paperboard Production	Total Suspended Solids ppm	Total Suspended Solids Pounds per ton of Paperboard Production
Evaporator Condenser Effluent (Salt Water)	Salt water used in barometric condensers to create a vacuum on evaporators. Results obtained by difference.	20.20	15,500	90.2	11.33°	86	10.00°
Turpentine Surface Condenser Cooling Water (Salt Water)	Water used to condense vapors released from the digesters during the cooking process.	3.60	2,760	0.60	L-0.1°	46	0.84°
Wood Yard Sewer	Water used as lubricant on chains of log conveyors. Water to the conveyors comes from decker seal pit.	0.48	370	532	1.62	784	2.38
Paper Mill Effluent	Intermittent overflow from wire and seal pits, paper mill washup, and overflow from filtered white water chest.	4.00	3,080	128	3.22	261	6.68
Pulp Mill Surface Ditch	Components include leaks and spills from around Cottrell precipitators, black liquor storage tanks, bark burner feed pump packing gland, and other low volume intermittent flows from pulp mill.	0.13	100	428	0.43	330	0.32
Caustic Room and Mud Filter Room Sewers	Wastes from causticizing operations consisting of combined wastes from mud filter washing, grit from classifiers, and dregs from green liquor washing.	0.063	48	414	0.16	756	0.31
Turpentine Separator Underflow	Water removed from crude turpentine by gravity separation.	0.058	45	5,950	2.22	10	0.00
Recovery Room Effluent	Waste consists of spills and leaks from black liquor storage tanks, pump leakage, furnace cooling water, and other unidentified waste flows.	0.24	185	897	1.36	243	0.36

SOURCES OF LIQUID WASTES AND AVERAGE RESULTS OF THE MORE SIGNIFICANT CONSTITUENTS (Continued) - 2

Waste Designation	Source of Waste or Explanation	Discharge MGD	Discharge Gallons per ton of Paperboard Production	B.O.D., 5-Day-20°C. ppm	B.O.D., 5-Day-20°C. Pounds per ton of Paperboard Production	Total Suspended Solids ppm	Total Suspended Solids Pounds per ton of Paperboard Production
Blow Heat Accumulator Overflow and Decker Seal Pit Overflow	Combined waste as sampled was total pulp mill effluent, and consisted of recovery room wastes, turpentine separator underflow, condensed blow tank vapors, and decker seal pit water. Results for components were obtained by difference.	6.80	5,230	321	14.00	198	8.62
Crude Tall Oil Plant and Cinder Pond Effluents	Consists of crude tall oil plant wastes and cinders from the bark burners suspended in pulp mill white water.	0.207	159	278	0.38	71	0.10
Power Plant Effluent (Salt Water)	Combined wastes as sampled consisted of power house condenser salt water, and tall oil and turpentine refinery wastes from the Arizona Chemical Company. Results for this component were obtained by difference.	13.4	10,300	-	L-0.1	33	1.32
TOTAL	Sum of all above waste components	49.2	37,800	-	34.7°	-	30.9°
COMBINED MILL EFFLUENT (BAYOU CHICO EFFLUENT) AND POWER PLANT EFFLUENT (SALT WATER)	Consists of effluents from Bayou Chico (approximately seven days retention) and power house condenser salt water. These two effluents make up the total plant discharge to St. Andrews Bay.	47.6	36,600	-	32.8°	-	22.5°

° Net results, quantities in mill influent have been subtracted.

L Indicates quantities "less than" those listed.

Results of analyses of Arizona Chemical Co. effluents are not included in the above tabulations.

collected. These wastes, along with salt water and fresh water mill influents, were analyzed in order to correct for constituents not attributable to pulp and paper manufacture.

The existing sewers at the mill were such that complete segregation of all process wastes was not entirely possible. The following table lists the wastes as collected at the mill, the source of the wastes, and the average results of more significant analyses:

The total plant discharge determined by adding the flows of the various components amounted to 49.2 M.G.D. or 37,800 gallons per ton of paperboard production. The total plant effluent determined by measuring the flows of the two outfalls amounted to 47.6 M.G.D. or 36,600 gallons per ton of paperboard production. The figures obtained by the two methods of measurement are in remarkably close agreement. The slight difference in the two figures can be partly accounted for by the fact that the majority of the plant wastes were retained in Bayou Chico lagoon for approximately seven days. This allowed for some evaporation into the atmosphere and seepage into the ground.

Certain physical, chemical, and biological changes took place in the retention lagoon. This is evidenced by the differences in values obtained for various constituents by totaling the waste components and by totaling the final plant effluents. B.O.D. quantities averaged 34.7 pounds per ton of paperboard production based on the waste component totals and 32.8 pounds per ton based on the analyses of the two outfalls. Suspended solids averaged 30.9 pounds per ton of production based on total component flows and 22.5 pounds based on final plant effluents.

GENERAL INFORMATION

1. Organization of Survey

This co-operative project was conducted by the Environmental Health Center of the U. S. Public Health Service and the Southern Kraft Division of the International Paper Company. Representatives of the Florida State Board of Health and the National Council for Stream Improvement of the Pulp and Paper Industry furnished advice and counsel in planning and conducting the survey.

Analytical determinations were made in mobile laboratory units by chemists of the Public Health Service. The technical staff of the International Paper Company supplied necessary operational data and assisted the personnel of the survey in becoming familiar with operations of the Panama City plant. The company also supplied several temporary measuring devices, utility connections for the mobile units, engineering equipment, and the full-time services of a chemical engineer and six sample collectors.

Public Health Service engineers supervised the sample collection and flow measurements.

2. Period of Survey

March 17 through April 10, 1952 - Sampling of wastes.

3. Personnel

Personnel participating in preliminary meetings at which this project was arranged, in planning conferences and in conduct of the survey included the following:

INTERNATIONAL PAPER COMPANY, SOUTHERN KRAFT DIVISION

Mobile, Alabama Office

A. W. Pesch, Chemical Engineer
A. H. Dumaree, Co-ordinator of By-products
H. D. Shope, Civil Engineer
C. L. Davis, Chemical Engineer

Panama City, Florida Mill

J. W. Lowrey, Sr., Mill Manager
C. A. Brady, Technical Director
B. J. Russell, Chemist
J. J. Vick, Technical Assistant to Pulp Mill Superintendent
B. F. Leto Chief Chemist
B. A. Clubbs, Plant Engineer
F. S. McMillan, Production Superintendent

ARIZONA CHEMICAL COMPANY

A. H. French, Manager Tall Oil Refinery
W. A. Hein, Manager Turpentine Refinery

FLORIDA STATE BOARD OF HEALTH

John Wakefield, Sanitary Engineer
William M. Beck, Jr., Biologist

NATIONAL COUNCIL FOR STREAM IMPROVEMENT

H. W. Gehm, Technical Advisor
W. A. Moggio, Southern Resident Engineer and Project Leader

U. S. PUBLIC HEALTH SERVICE, ENVIRONMENTAL HEALTH CENTER

H. H. Black, Chief, Industrial Wastes Section
G. N. McDermott, Senior Assistant Sanitary Engineer
V. A. Minch, Assistant Sanitary Engineer
R. L. Harris, Assistant Sanitary Engineer
W. W. Walker, Chemist
C. N. Shadix, Chemist
C. R. Hirth, Physical Science Aide
M. D. Currey, Chauffeur-Mechanic

4. Purpose

This survey was conducted to determine the source, quantity, concentration, and characteristics of liquid wastes resulting from kraft pulp and

paper manufacturing processes. The primary objectives of this study were to obtain original and additional data to supplement existing information on the individual and combined wastes. The results of this survey and similar studies will serve as a basis for preparation of an industrial waste guide to the industry.

5. Location of Plant

The Panama City mill of the International Paper Company is located on a 350 acre tract of land adjacent to the city of Panama City, Florida. The industrial plant, laboratories, and offices are situated immediately adjacent to St. Andrews Bay which is open to the Gulf of Mexico.

6. Production

The paper mill production varies from about 1,100 to about 1,450 tons of finished kraft board per day. The only two products manufactured are fourdrinier liner board and corrugating board. Production figures for the days of waste sampling are as follows:

Date	Finished Board, Tons
March 17	1,247
18	1,107
19	1,250
20	1,363
24	1,322
25	1,363
26	1,355
27	1,427
31	1,355
April 1	1,319
2	1,267
3	1,316
7	1,292
8	1,322
9	1,255
10	1,302
Average	1,300

The entire pulp production is utilized in paper making operations. No pulp is shipped to or received from other mills.

The by-products of the pulp mill are crude sulfate turpentine and crude tall oil. Both of these by-products are sold to the Arizona Chemical Company. The yield of by-products vary from 1 1/2 to 3 gallons of crude turpentine and from 50 to 100 pounds of crude tall oil per ton of board produced.

7. Raw Materials

Raw materials used at the plant are as follows:

Raw Material	Approx. Quantity per Ton Board
Pine Wood	1 1/2 to 1 3/4 cords
a. Longleaf Pine	
b. Slash Pine	
c. Loblolly Pine	
d. Other Pines	
Alum	10 - 50 pounds
Rosin Size	0 - 40 pounds
Lime	20 - 25 pounds
Salt Cake	150 - 200 pounds
Starch	
Wax	
Sulfur	
Kerosene	

8. Operation

The pulp mill operates continuously at a comparatively constant rate. Two 235 inch Fourdrinier paper machines operate continuously except for infrequent short periods for changing the machine wire, etc.

Both the pulp and paper mills are shut down on Labor Day, Christmas, and July 4. Occasional shutdowns are scheduled for maintenance purposes. The mill operates about 350 days per year.

9. Water Supply

Fresh water is obtained from both deep (500 feet) and shallow (100 feet) wells. Approximately 10,000 gallons per minute of fresh water is pumped from 18 deep wells and 2 shallow wells for process use. Seven shallow wells supply the water requirements for boiler feed.

Salt water for condensing and cooling purposes is pumped from Watson Bayou and is used as follows:

Evaporator barometric condensers
Turpentine surface condensers
Power house surface condensers and
Oil coolers
Barometric condensers (Arizona Chemical Company)

10. Waste Disposal

All process wastes from the mill, except power house condenser salt water are discharged to an impoundment basin known as Bayou Chico. Salt water from the power house is discharged directly to St. Andrews Bay. Process wastes, from Bayou Chico are discharged continuously through a 54 inch underwater pipe line extending approximately 1,600 feet into St. Andrews Bay with fourteen outlets to give rapid mixing and maximum dilution over a distance of 280 feet on the discharge end. Arizona Chemical Company salt water goes to St. Andrews Bay through the International Paper Company salt water ditch after temporary impoundment for settling purposes.

Sanitary sewage is treated in septic tanks and does not enter any of the process waste sewers.

PULP MANUFACTURING PROCESSES

All pulp manufactured at the Panama City mill is produced by the kraft or sulphate process. This process, consists essentially of dissolving a por-

tion of the wood, mainly lignin and hemicelluloses, and leaving a fibrous product consisting mainly of cellulose.

11. Log Handling and Chipping

Pine wood is obtained from areas in Florida, Georgia, and Alabama and delivered to the mill by rail and truck. Some of the wood is unloaded directly to log conveyors for immediate processing. The remainder is stored for future use.

Conveyors carry the logs to a rotating barrel type barking drum. As the logs rub against each other and the drum walls the bark is rubbed off and falls through openings in the drum to a conveyor which transports the bark to boilers for use in steam generation.

Debarked logs are forced out of the drum by incoming wood and are conveyed to chippers. The chippers are revolving steel discs with attached knives. The weight of the log being chipped holds it against the face of the chipper. The desired chip length is about 5/8 inch.

Oversize chips are removed from acceptable sizes by passing the chips over vibrating screens. These chips are reduced by hammer mills and delivered with proper sized chips to storage bins located above the digesters.

12. Digestion

The Panama City mill operates 16 direct-heated stationary digesters. The digesters are vertical cylindrical steel pressure vessels with dished or conical bottoms. Chips are loaded into the digesters by gravity flow from storage bins above. The required amount of white liquor and black liquor is then added. White liquor, the principal part of the cooking liquor, is an

aqueous solution of sodium hydroxide, sodium sulfide and sodium carbonate, and containing minor quantities of sodium sulfate, sodium thiosulfate, etc. Black liquor is the name given to liquor recovered from previous cooks. A portion of this liquor is returned to the digesters in order to facilitate optimum cooking results, maximum economy, etc. Black liquor contains the more or less altered white liquor chemicals, the dissolved wood components, and added water originating from the moisture in the wood chips, condensed steam, and wash water.

Steam is admitted to the digesters at the bottom to supply the required heat and to cause circulation of the cooking liquor.

As the pressure rises in the digester, air along with steam, turpentine vapors, and other volatile gases are bled off through a separator, to remove any liquor, and then through a surface condenser. The condensate consists mainly of water and crude sulfate turpentine. The crude turpentine after separation is sold to the Arizona Chemical Company.

The digesters are brought up to and cooked at about 115 lbs. pressure. Relief of steam and gases continues throughout the cook. During the reactions that take place in the digester lignin and other non-fibrous wood components dissolve in the cooking liquor. Fats and resins are saponified and dissolve in the cooking liquor. Material in the digester at the end of the cook consists of pulp and black liquor under a pressure of about 115 lbs. gage and at a temperature of about 350°F.

At the end of the cook a valve in the bottom of the digester is opened and the pressure forces the contents through a cyclone type separator where pulp and black liquor is separated from flash steam. The pulp and black

liquor fall into a large steel tank, known as a blow tank, and the steam passes through a heat recovery system where it is used for the production of hot water. The water used to condense the steam in the heat recovery tank is fresh water or white water from final pulp washing on the deckers. Water from the deckers is referred to as decker seal pit water or pulp mill white water.

13. Pulp Washing

The purpose of washing is to separate the fibers from the liquor. The fibers are referred to as pulp and the liquor as black liquor. The mixture of pulp and black liquor is pumped to rotary vacuum filters, known as brown stock washers, where the liquor is removed from the pulp. Because the black liquor is subsequently concentrated and processed for recovery of chemicals it is essential that the dilution with wash water be kept at a minimum consistent with maximum recovery of chemicals and well-washed pulp.

Each of the five brown stock washer units consists of three counter current rotary filters. In this system pulp and black liquor from the blow tank is pumped to the first stage filter. Each filtering surface is a closely woven wire cloth attached to the outside of a revolving drum which is partially submerged in a vat containing the pulp and black liquor. The liquor drains through the screen and leaves the drum through a hollow axial bearing. The pulp clings to the surface of the screen forming a mat which is discharged from the screen as the drum rotates. A water or liquor spray is directed on the pulp mat on each filter. Hot water is used as wash on stage three. The filtrate from stage three is used as wash on stage two. The filtrate from stage two is used as wash on stage one. The filtrate from stage one goes to

the evaporators and then the recovery room with a portion returned to the digesters as noted above. Counter current washing is thus achieved. Either fresh water or water from the heat recovery tank can be used as the final wash on the third stage of the washers.

Pulp from stage three diluted with decker seal pit water to a consistency suitable for pumping goes to the screens.

14. Screening

The washed pulp contains some chips which were not completely digested in the cooking process. These are removed from the pulp with centrifugal screens, and converted into pulp by mechanical refining.

The accepted stock passes over rotary filters called deckers which serve a dual purpose as washers and thickeners. The pulp is diluted to a low consistency prior to screening and this excess water is removed by the deckers. Fresh water or paper mill white water, which is filtered wire and seal pit water from the paper mill saveall, is used as shower water on the deckers, thus still more washing of the pulp is accomplished. The pulp from the deckers is discharged to storage chests prior to use in the paper mill.

15. Chemical Recovery

The entire economic feasibility of the sulfate process is dependent upon the recovery of the cooking chemicals, and at the same time production of steam using the dissolved organic portion of the wood as fuel.

Black liquor from the washing processes is about 85 per cent water and this liquor must be concentrated to the density required for combustion in the recovery furnace. Also the liquor contains small amounts of suspended

material which passes through the wire screens of the washers. This suspended material causes scale formation in the evaporator tubes and is removed.

The Panama City mill employs one 6-body quintuple and two 6-body sextuple effect long tube vertical evaporators for the initial concentration of black liquor. The mill also has one 4-body triple effect forced circulation type evaporator on a standby basis, which was not in use during the period of the survey. All of the evaporators have barometric condensers using salt water as the condenser water.

The evaporator condensate is used as boiler feed or for process purposes.

The concentrated black liquor from the multiple effect evaporators is further dewatered by contact with the flue gases from the recovery furnace. Disc and cascade type evaporators are used for this operation.

When the black liquor has been sufficiently concentrated to allow the organic material to burn without additional fuel it is mixed with enough salt cake, Na_2SO_4, to make up the soda loss of the mill and sprayed into the recovery furnace.

In the furnace, with proper air distribution, the organic matter is burned and the inorganic chemicals melt to form a molten mass called "smelt." Air distribution is important because there must be sufficient oxygen for complete combustion and still maintain a reducing atmosphere in the lower part of the furnace. This reducing atmosphere is necessary to reduce the sodium sulfate to sodium sulfide. Dust which may carry over in the flue gases from the recovery furnace is removed by Cottrell precipitators and the recovered soda dust is returned to the process.

The smelt, consisting mostly of sodium carbonate and sodium sulfide, flows out of the furnace into a dissolving tank where most of it dissolves to form

green liquor. The insoluble matter, called green liquor dregs, is removed in tray type clarifiers. The dregs are pumped to a tray washer where most of the green liquor is removed. The washed dregs are discharged to a settling pond.

The clarified green liquor passes from the clarifiers to mechanical slakers where fresh and reburned lime are added. The lime reacts with the sodium carbonate in the green liquor to form sodium hydroxide and an insoluble calcium carbonate mud. The lime contains sand and grit which are removed by bowl classifiers. Because the reaction is not completed in the slaker and classifier, causticizing tanks are used to allow retention time for the reaction to be completed. This liquor, after clarification, is the white liquor referred to in the narrative of the digestion process.

Calcium carbonate mud is separated from the unclarified white liquor in tray type clarifiers. The white liquor goes to storage tanks and the mud is sent to tray type washers where most of the white liquor is removed. The mud is then filtered on rotary vacuum filters and fed to the lime kiln where it is converted to reburned lime.

Carryover dust from the lime kiln is passed through spray chambers where most of it is recovered and returned to process. A flow diagram of the pulp mill operations is presented in Figure 1.

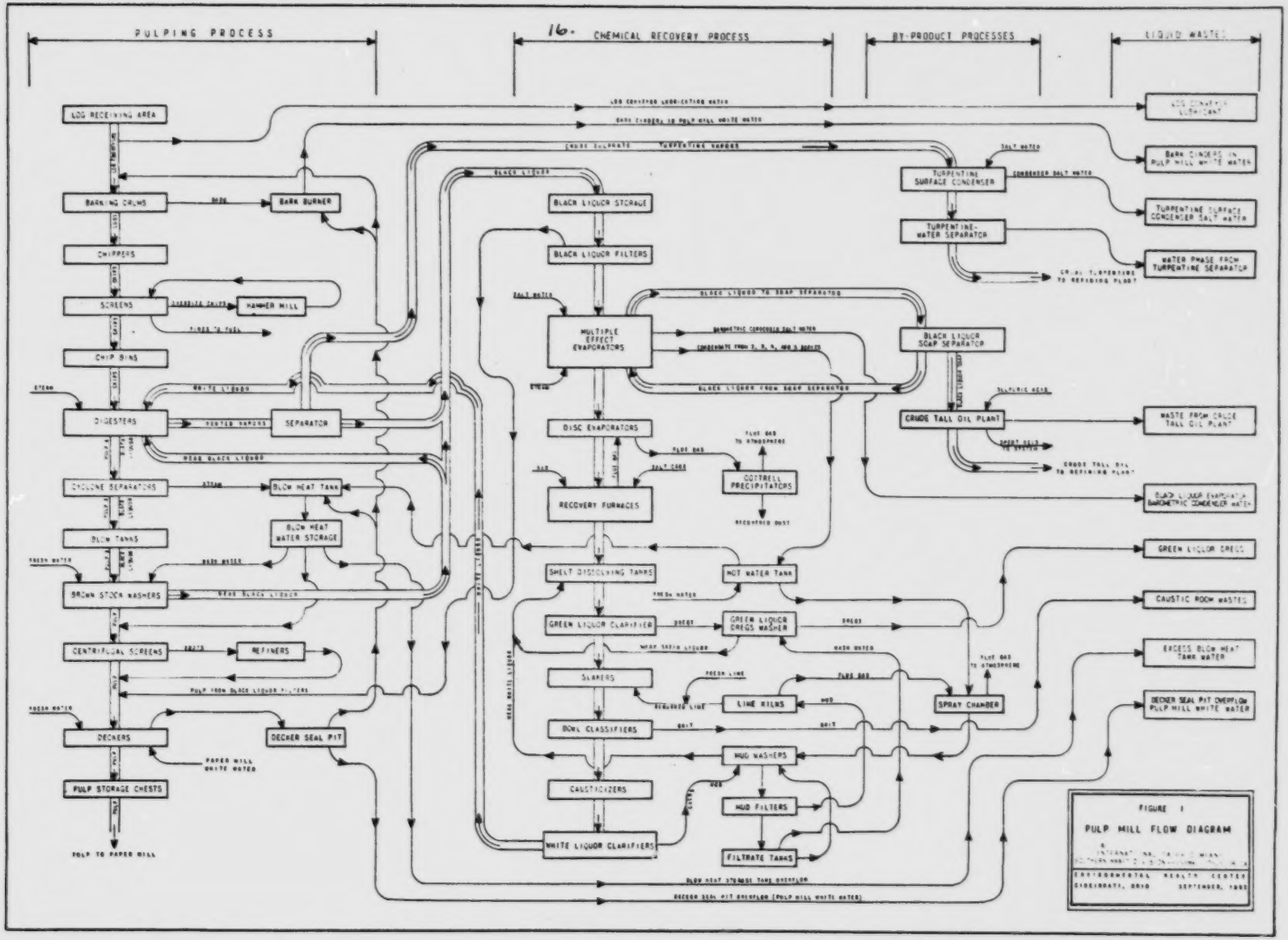

FIGURE 1

PULP MILL FLOW DIAGRAM

ENVIRONMENTAL HEALTH CENTER
CINCINNATI, OHIO SEPTEMBER, 1968

PAPER MANUFACTURING PROCESS

16. Pulp Preparation

Washed pulp from the deckers must receive suitable mechanical treatment before it can be used to form paper. Machines called refiners treat the pulp until it is acceptable for paper making.

A refiner consists essentially of one rotating grooved disc and one stationary grooved disc. The pulp is introduced at the center and between the discs. The rapid rotation forces the pulp out between the discs where it is subjected to a grinding, cutting and brushing action.

Rosin size and alum when required are added to the refined pulp prior to formation of the sheet. The size makes the sheet less water absorbent. The alum precipitates the size on the fibers.

17. Sheet Formation

The pulp is diluted to a low consistency before being pumped to the head box of the paper machines. The principal part of a Fourdrinier machine is a moving endless belt of fine-mesh wire cloth. From the headbox the pulp is evenly distributed over this moving wire screen. A mat of interlaced fibers forms as water drains through the screen. Additional water is removed by suction applied to the underside of the screen. This water removal mats the fibers more firmly.

At this point the soggy mat of fibers is strong enough to make the jump unsupported to endless felt belts where a series of cylinders called press rolls remove still more water. From the press rolls the sheet passes to numerous drying cylinders filled with steam. The paper sheet then passes through a stack of polished iron rolls called calenders where the final finish

is applied. The finished sheet is wound into reels. The reels are rewound into rolls of the desired width and diameter.

Most of the water that drains through the wire screen flows into what is known as the wire pit. The water removed by the suction boxes flows into what is known as the seal pit. Both of these waters are referred to as white water and contain some fiber. A rotary vacuum filter is used to remove these fibers. This filtered water is called filtered white water and most of it is reused in the process. That portion which is not reused, combined with intermittent overflow from the wire and seal pits make up the waste going to the paper mill sewer. A flow diagram of the paper mill operations is given in Figure 2.

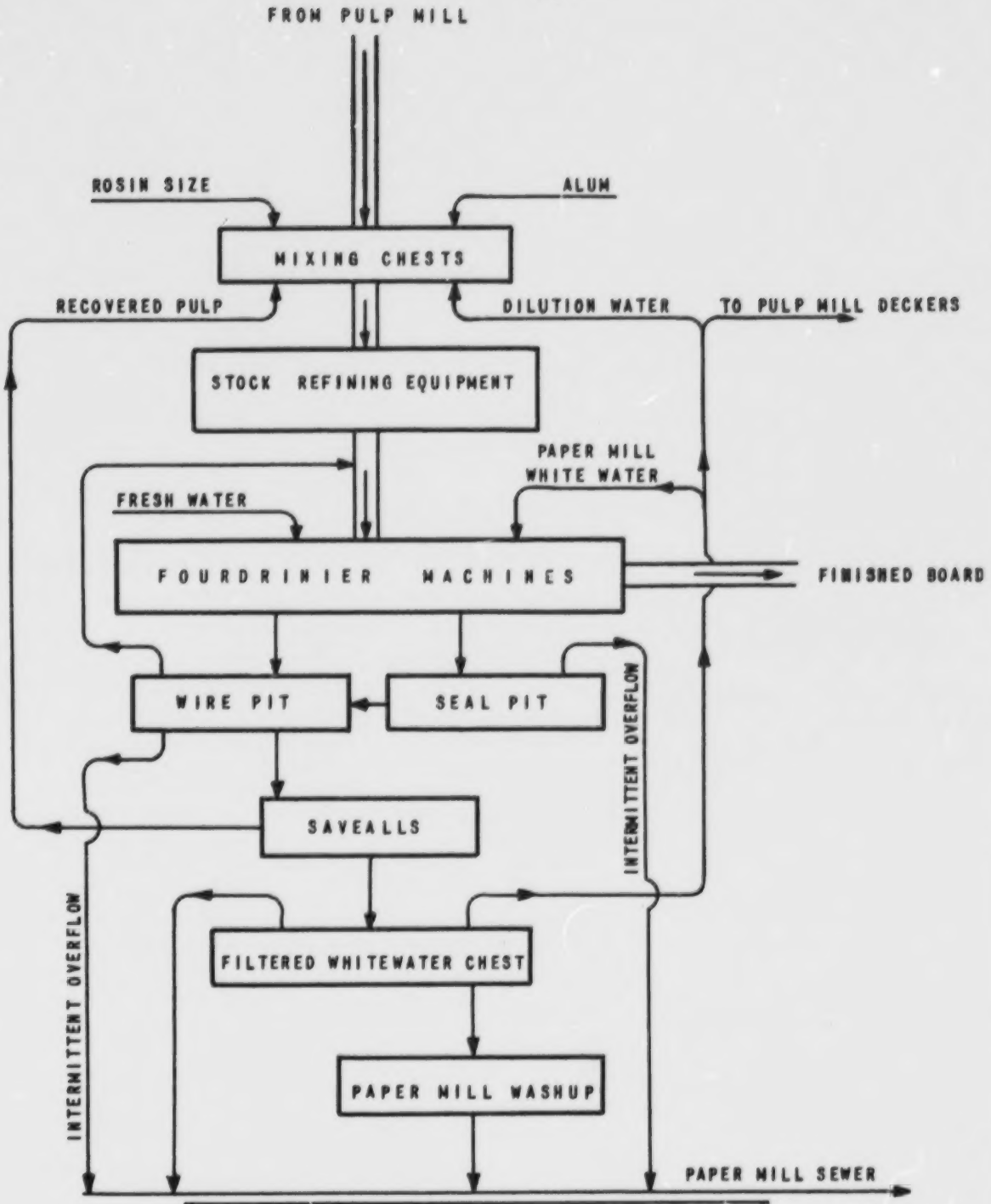

FIGURE 2
PAPER MILL FLOW DIAGRAM
INTERNATIONAL PAPER COMPANY
SOUTHERN KRAFT DIVISION – PANAMA CITY, FLORIDA

ENVIRONMENTAL HEALTH CENTER
CINCINNATI, OHIO SEPTEMBER, 1952

SURVEY PROCEDURES

18. Sample Collection

During the survey samples were collected from the following sources:

Number	Source
1	Combined Mill Effluent (Bayou Chico effluent)
2	Salt water ditch
2B	Tall Oil and Turpentine Refinery Pond Overflow (Arizona Chemical Company)
3	Evaporator surface condenser cooling water (salt water) and turpentine surface condenser cooling water (salt water)
3D	Turpentine Surface Condenser Cooling Water (Salt Water)
4	Wood Yard Sewer
4A	Pulp Mill White Water Log Conveyor
5	Pulp Mill Surface Ditch
6,7 & 8	Old Caustic Room Sewer, New Caustic Room Sewer, and Mud Filter Room Sewer (Composite Sample)
9	Total Pulp Mill Effluent
9A	Recovery Room Effluent
9B	Turpentine Separator Underflow
10	Crude Tall Oil Plant and Cinder Pond Effluent
10A	Crude Tall Oil Plant Pond Influent
10B	Crude Tall Oil Plant Pond Effluent
11	Paper Mill Effluent
12	Salt Water Mill Influent
13	Fresh (Well) Water Mill Influent

All samples were composite samples consisting of 24 portions. These portions were collected at one-hour intervals between 8:00 AM and 7:00 AM. Two exceptions were the salt water mill influent and the fresh water mill influent which were grab samples. All samples were analyzed on the day the sample compositing was concluded. For example; samples designated as March 17, 1952, were composited from 8:00 AM on March 17, 1952 to 7:00 AM on March 18, and were analyzed on March 18.

Samples for sulfide determinations were composited in separate bottles

to which zinc acetate had been previously added. The zinc precipitated the sulfides, thereby preventing their volatilization or oxidation.

19. Flow Measurements

Permanent measuring devices existed at two locations and three others were installed by plant engineers for the duration of the survey. Flow measurements at eight other locations were made using a standard Price current meter, time-volume relation, or pitot tube. All installations were checked as to suitability, weir crest conditions, approach conditions, or other factors that might influence the accuracy of measurement. Corrections were applied where necessary. Water level records, giving a continuous flow record, were used at four locations in connection with flow measuring devices. Figure 3 shows the waste sources and the various devices used to measure flows. Explanation of measuring methods and formula used are as follows:

Bayou Chico Effluent - Measurement of the main plant effluent, after passing through Bayou Chico, was by means of a Price current meter using the cable suspension. Water level recorder readings were used to prepare a rating curve for this station. Conditions for measurement were not ideal and results could be in error $\pm$ 10 per cent.

Salt Water Ditch - Measurements were made using a Price current meter. Water level recorder readings were correlated with flow and a rating curve prepared. Conditions were favorable for current meter use and results are reliable.

Tall Oil and Turpentine Refinery Pond Overflow - Measurements were made in the same manner as those for the salt water ditch.

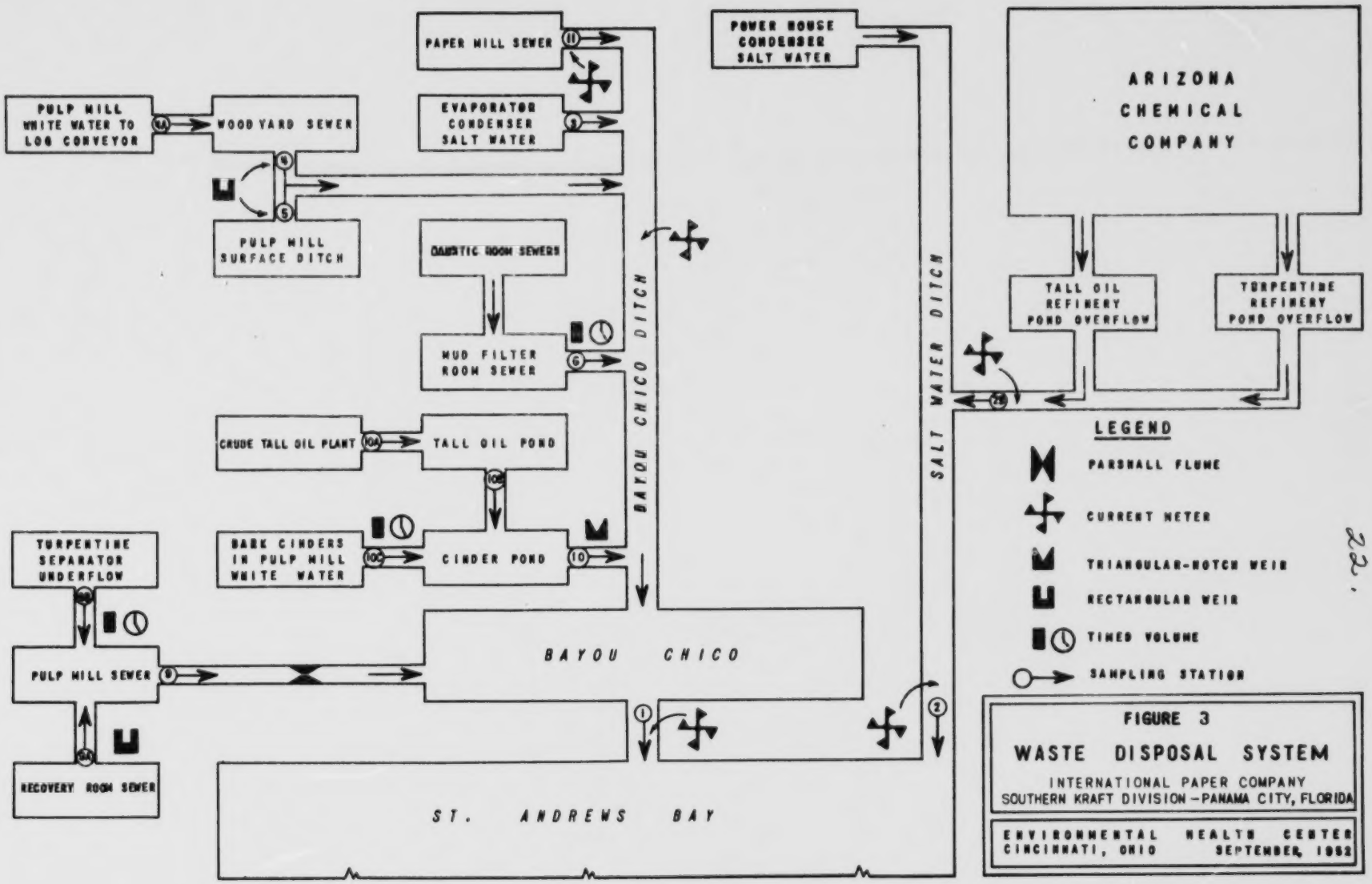

FIGURE 3

WASTE DISPOSAL SYSTEM

INTERNATIONAL PAPER COMPANY
SOUTHERN KRAFT DIVISION – PANAMA CITY, FLORIDA

ENVIRONMENTAL HEALTH CENTER
CINCINNATI, OHIO SEPTEMBER, 1952

22.

Evaporator Condenser Salt Water and Turpentine Surface Condenser Cooling Water - The flow for this station was obtained by difference. The total flow in Bayou Chico ditch was determined using a Price current meter and correlating flow with water level recorder readings. The sum of previously measured flows of all other wastes entering the ditch upstream from this measuring station was subtracted from the total flow. The difference was used as the waste flow.

Turpentine Surface Condenser Cooling Water - This flow was estimated by C. A. Brady, Technical Director, to be constant at 2,500 G.P.M.

Wood Yard Sewer - Flow at this station was measured using a 9 1/4 inch broad-crested rectangular weir. The following formula was used in determining discharge:

$$Q = (2.4 - 0.62h)\, h^{3/2}$$

where Q = discharge in cubic feet per second

and h = head in feet.

Pulp Mill White Water to Log Conveyor - Flow at this point was considered equal to the flow of the wood yard sewer. A slight error in this assumption is evident since some water is carried on the logs to the barking drums.

Pulp Mill Surface Ditch - Measurements were made using a 90° V-notch sharp-crested weir. Conditions were not satisfactory for making precise measurements as this waste carried suspended solids that were deposited behind the weir.

Caustic Room and Mud Filter Room Sewers - Measurements were made using a calibrated drum and a stop watch. Measurements were made hourly as the

sample was collected.

Total Pulp Mill Effluent - Flow determinations were made using a 3-foot Parshall flume with an integrating recorder. Due to the nature of the waste which was hot and steaming and to the inaccessibility of the sewer, this installation was not checked as to physical condition. Figures supplied by technical personnel of the mill, which were obtained from the integrating charts, were used for this point. These figures were considered accurate by plant personnel.

Recovery Room Effluent - Flow measurements at this station were made using an existing 9 inch broad-crested rectangular weir. The following formula was used in calculating discharge:

$$Q = (2.5 - 0.62h)\, h^{3/2}$$

where Q = discharge in cubic feet per second

and h = head in feet.

Turpentine Separator Underflow - Discharge from this source was measured using a calibrated drum and a stop watch. Volumetric measurements were made hourly as the sample was collected.

Tall Oil and Cinder Pond Effluent - Flow measurements of this waste were made using an existing 80° V-notch broad-crested weir. The weir was calibrated using a stop watch and a barrel of predetermined volume. Discharge figures were obtained by applying a correction factor of 0.77 to values obtained from tables prepared for a 90° V-notch sharp-crested weir.

Tall Oil Pond Influent - Flow figures for this point were obtained by difference. The volume of waste going to the cinder pond was subtracted

from the combined effluent of the tall oil and cinder pond.

Tall Oil Pond Effluent - This waste flow was considered to be the same as the pond influent. This was not entirely correct as tall oil was periodically burned from the surface of the pond. The amount thus disposed of was not determined.

Paper Mill Effluent - Flow measurements in the paper mill sewers were originally made using Price current meters and correlating discharge against staff gage readings. This method was not satisfactory except at low flows. Velocity measurements using a pitot tube inserted in a 30 inch effluent pipe were subsequently made and the velocities obtained at different flows were correlated with the original staff gage readings. A curve showing velocity, discharge, and gage height was prepared for this waste.

Salt Water Mill Influent - The volume of salt water entering the mill was assumed to be the same as that leaving the mill as evaporator condenser salt water and turpentine surface condenser cooling water. The figures used for mill influent do not include the quantity used in power house condenser or that used by Arizona Chemical Company.

Fresh Water Mill Influent - The volume of well water used by the mill was estimated by plant personnel to be 10,000 G.P.M.

20. Laboratory Analyses

All or part of the following laboratory determinations were made on the samples collected:

Immediate Oxygen Demand
Biochemical Oxygen Demand, 5-day, 20° C.
Oxygen Consumed (Cr_2O_7)
Acidity
Alkalinity

pH
Color
Lignins and Tannins
Sulfides
Chlorides
Total Solids, Total, Volatile, and Fixed
Suspended Solids, Total, Volatile, and Fixed

The procedures followed in making the above analyses are, in general, as given in "Standard Methods for the Examination of Water and Sewage," 9th Edition. Modifications of the procedure used for the oxygen consumed determination are given in the appendix of this report.

EXPLANATION OF LABORATORY DETERMINATIONS

21. Immediate Oxygen Demand

Certain compounds when present in liquid wastes combine with available oxygen in a relatively short period of time. The amount of oxygen utilized within 15 minutes of mixing with dilution water of known oxygen content is known as immediate oxygen demand. This analysis is of special value as an aid in determining the amount of oxygen that must be provided by receiving streams during the course of stabilization.

22. Biochemical Oxygen Demand (B.O.D.)

The biochemical oxygen demand of sewage, sewage effluents, polluted waters, or industrial wastes, is the oxygen required during stabilization of the decomposable organic matter by aerobic bacterial action. Since this is a phenomenon into which both time and temperature enter, a standard set of conditions (5 days at 20° C.) is universally used for the test. For normal domestic sewage, and some industrial wastes, approximately 68 per cent of the oxygen requirement of the carbonaceous material present is

satisfied during the standard test. Because of the variable carbon-nitrogen ratio of industrial wastes, however, the rate of oxygen demand of such wastes may not follow the typical oxidation curve for domestic sewage. Results are expressed in parts per million (ppm).

23. Oxygen Consumed (Cr_2O_7)

The oxygen consumed test is a measure of the chemical oxidant required to oxidize the organic matter present in a sample under particular standard conditions. The test is of value in estimating the strength of certain industrial wastes, and in conjunction with the B.O.D. determination. It can be used where it would be of an advantage to obtain results indicative of oxygen demand in less time than the biochemical oxygen demand test requires. Results are expressed in parts per million oxygen and have been corrected for chloride content. The method used was the acid dichromatic method which is applicable to a larger variety of wastes with certain advantages in precision and reproducibility.*

24. Acidity

Acidity of a water or waste is usually caused by the presence of uncombined carbon dioxide, mineral acids and salts of strong acids and weak bases. By using phenolphthalein and methyl orange indicators the amount of each type of acidity present can be determined. Phenolphthalein acidity is usually referred to as total acidity, while methyl orange acidity is referred to as mineral acidity. Results are expressed as parts per million calcium carbonate ($CaCO_3$)

* Determination of Oxygen-Consumed Values of Organic Wastes
by W. Allan Moore, F. J. Ludzack and C. C. Ruchhoft.
"Anal. Chem., Vol. 23, Page 1297, Sept. 1951."

Alkalinity

Alkalinity of a water or waste represents the carbonates, bicarbonates, hydroxides, and occasionally the borates, silicates, and phosphates of the alkali and alkali earth metals. By use of the phenolphthalein and methyl orange end points, the amount of each type of alkalinity can be determined. Methyl orange alkalinity is usually referred to as total alkalinity. Calcium and magnesium account for most of the alkalinity present in a sample. Results are expressed as parts per million calcium carbonate ($CaCO_3$).

26. pH

The symbol pH denotes the negative logarithm (to the base 10) of the hydrogen ion concentration of a solution, this symbol being a universal one in chemistry. The pH value indicates the relative acidity or alkalinity of a water or waste, being lower with higher degrees of acidity. It is a measure of intensity rather than quantity. All pH determinations, during this survey, were made using a Beckman electrometric pH meter, Model G.

27. Color

True color of a water or waste is due to the presence of coloring matter in a solution. Apparent color is due to color in suspension in the liquid and can be removed by sedimentation or filtration. True color is usually caused by extracts of decomposing vegetable matter or, in the case of industrial wastes, by chemicals or compounds from processing various raw materials. Color is expressed in parts per million and is measured by comparing the water sample with prepared standards of potassium chloroplatinate. Apparent color determinations were not made on any samples during this survey.

28. Lignins and Tannins

The exact chemical composition of tannin and lignin is not known. These

compounds are more or less soluble in water and exhibit characteristic colors in aqueous solutions. Lignins in combination with phenols and organic bases give colors ranging from yellow to dark red. Tannin extracts from wood, in aqueous solutions, range in color from light straw to dark red or brown. In addition all tannins are polyhydroxylic phenols and exhibit a marked tendency to absorb oxygen. The lignin and tannin determination serves as an aid in evaluating the nature of waters or wastes. Results are expressed in parts per million tannin and lignin as tannic acid.

29. Sulfides

The sulfide determination is a measure of the total sulfide content of a water or waste, and includes dissolved sulfides and acid soluble metallic sulfides present as suspended matter. Sulfides have an objectionable odor, are toxic to fish in low concentrations and are easily oxidized which creates an immediate oxygen demand in the receiving stream.

30. Chlorides

The chloride content of water has little significance from a sanitary standpoint. Chlorides are present in all natural water, particularly near the ocean and in the vicinity of salt deposits. Chloride in water may also be derived from sewage and industrial wastes. The finding of more chloride in a sample of water than would be normal for the region is a strong indication of contamination from outside sources.

31. Solids

The determination of solids includes those for total and suspended solids as well as their volatile constituents. Total Solids consist of all the

solids present in a liquid. The term includes both suspended and dissolved solids. Suspended Solids are in suspension or float on the surface of water, sewage or other liquid, and are removed by laboratory filtration. Dissolved Solids are found by subtracting suspended solids from total solids. Volatile Solids are those that are lost upon ignition of total solids (giving total volatile solids) or suspended solids (giving suspended volatile solids). Fixed Solids are determined by subtracting total volatile solids from total solids (giving total fixed solids) or suspended volatile solids from total suspended solids (giving fixed suspended solids). Volatile solids represent approximately the amount of organic matter, and fixed solids the inorganic matter in a water or liquid waste.

Suspended solids cause water to be turbid and unsightly and may be deposited in streams, interfering with navigation, and injury to the habitat of fish.

RESULTS

The volume and average concentration of significant constituents of the process wastes are presented in Table 1. This also lists the average concentration of certain constituents of fresh and salt water mill influent. Table 2 shows the quantity of those constituents. Values reported in both tables are gross results and have not been corrected for concentrations of constituents in the mill influent.

TABLE 1 - AVERAGE VOLUME AND CONCENTRATION OF COMPONENT WASTE CONSTITUENTS

Source	Discharge MGD	Immediate Oxygen Demand ppm	Biochemical Oxygen Demand ppm	Corrected Oxygen Consumed (Cr_2O_7) ppm	Color ppm	Lignin & Tannin as Tannic Acid ppm	Sulfides as S ppm	Chlorides as Cl ppm	Solids					
									Total Solids			Suspended Solids		
									Total ppm	Volatile ppm	Fixed ppm	Total ppm	Volatile ppm	Fixed ppm
Evaporator Condenser Effluent (Salt Water) and Turpentine Surface Condenser Cooling Water (Salt Water)	23.8	14	77	113	115	65	16	11700	22700	7200	15500	79	63	16
Turpentine Surface Condenser Cooling Water (Salt Water)	3.60	0.19	0.60	L - 1	32	1	L-01	10700	22200	5400	16800	46	25	21
Wood Yard Sewer	0.48	29	532	1850	575	250	L-0.1	29	2020	1230	790	784	725	59
Pulp Mill White Water to Log Conveyor	0.47	15	242	716	450	125	L-0.1	31	1240	469	771	154	137	17
Paper Mill Effluent	4.0	0.7	128	514	52	22	-	53	1030	368	662	261	249	12
Pulp Mill Surface Ditch	0.13	40	428	-	2180	370	2.9	-	2490	1100	1390	330	248	82
Caustic Room and Mud Filter Room Sewers	0.063	319	414	-	-	-	208	-	6000	940	5060	756	405	351
Total Pulp Mill Effluent	7.10	21	383	1080	840	153	4.9	12	1660	560	1100	198	178	20
Recovery Room Effluent	0.24	204	897	3510	6570	991	73	127	6720	2100	4620	243	190	53
Turpentine Separator Underflow	0.058	232	5950	7120	310	1490	74	1350	2910	770	2140	10	8	2
Crude Tall Oil Plant and Cinder Pond Effluents	0.207	11.9	278	624	220	-	-	73	5040	532	4510	71	56	15
Crude Tall Oil Pond Influent	0.064	140	2440	7100	425	1050	-	280	9570	3830	5740	2200	2180	20

TABLE 1 - AVERAGE VOLUME AND CONCENTRATION OF COMPONENT WASTE CONSTITUENTS (Continued) - 2

Source	Dis-charge MGD	Immediate Oxygen Demand ppm	Biochemical Oxygen Demand ppm	Corrected Oxygen Consumed (Cr_2O_7) ppm	Color ppm	Lignin & Tannin as Tannic Acid ppm	Sulfides as S ppm	Chlorides as Cl ppm	Solids					
									Total Solids			Suspended Solids		
									Total ppm	Volatile ppm	Fixed ppm	Total ppm	Volatile ppm	Fixed ppm
Crude Tall Oil Pond Effluent	0.064	105	841	2370	410	1050	L-0.1	166	9860	1440	8420	784	779	5
Combined Mill Effluent (Bayou Chico Effluent)	34.2	26	150	250	110	82	26	8040	17400	4600	12800	96	75	21
Salt Water Ditch	17.8	0.92	8	-	-	-	1.6	12700	25800	5700	20100	27	14	13
Tall Oil and Turpentine Refinery Pond Overflow (Arizona Chemical Co.)	4.4	1.22	34	-	-	-	1.9	-	24500	5100	19400	30	18	12
Salt Water Mill Influent	22.9	-	1.55	-	30	-	L-0.1	12000	23400	7500	15900	9	6	3
Fresh (Well) Water Mill Influent	14.3	-	-	-	5	-	L-0.1	26	325	117	208	-	-	-

Above figures based on all samples analyzed and are gross results.

TABLE 2 - AVERAGE QUANTITY OF COMPONENT WASTE CONSTITUENTS

Source	Discharge MGD	Immediate Oxygen Demand	Biochemical Oxygen Demand	Corrected ** Oxygen Consumed	Color	Lignin & Tannin as Tannic Acid	Sulfides as S	Chlorides as Cl	Solids					
									Total Solids			Suspended Solids		
									Total	Volatile	Fixed	Total	Volatile	Fixed
		lbs/day												
Evaporator Condenser Effluent (Salt Water) and Turpentine Surface Condenser Cooling Water (Salt Water)	23.8	2780	15000	22400	22800	12900	3180	2320000	4630000	1460000	3170000	15900	12600	3300
Turpentine Surface Condenser Cooling Water (Salt Water)	3.60	6	18	-	960	30	-	321000	668000	162000	506000	1360	740	620
Wood Yard Sewer	0.48	116	2100	7400	2300	1000	-	116	7970	4860	3110	3100	2870	230
Pulp Mill White Water to Log Conveyor	0.47	59	942	2810	1760	490	-	122	4830	1830	3000	600	535	65
Paper Mill Effluent	4.0	23	4190	17100	1740	734	-	1770	33800	12300	21500	8680	8293	387
Pulp Mill Surface Ditch	0.13	43	554	-	2350	400	3	-	3100	1360	1740	416	314	102
Caustic Room and Mud Filter Room Sewers	0.063	167	214	-	-	-	109	-	2930	490	2440	403	222	181
Total Pulp Mill Effluent	7.10	1240	22800	63900	49700	9060	290	710	98700	33600	65100	11700	10510	1190
Recovery Room Effluent	0.24	408	1770	7020	13100	1980	146	254	13130	4080	9050	469	368	101

TABLE 2 - AVERAGE QUANTITY OF COMPONENT WASTE CONSTITUENTS (Continued) - 2

Source	Discharge	Immediate Oxygen Demand	Biochemical Oxygen Demand	Corrected ** Oxygen Consumed	Color	Lignin & Tannin as Tannic Acid	Sulfides as S	Chlorides as Cl	Solids					
									Total Solids			Suspended Solids		
	MGD	lbs/day							Total	Volatile	Fixed	Total	Volatile	Fixed
Turpentine Separator Underflow	0.058	112	2880	3440	150	721	36	653	1400	370	1030	5	4	1
Crude Tall Oil Plant and Cinder Pond Effluents	0.207	20	490	1080	380	-	-	126	8860	940	7920	128	102	26
Crude Tall Oil Pond Influent	0.064	75	1340	3790	227	560	-	149	5100	2170	2930	1240	1230	10
Crude Tall Oil Pond Effluent	0.064	56	453	1260	220	560	-	88	5240	790	4450	474	471	3
Combined Mill Effluent (Bayou Chico Effluent)	34.2	7420	43000	71300	31400	23400	7420	2290000	4970000	1310000	3660000	27300	21410	5890
Salt Water Ditch	17.8	136	1190	-	-	-	237	1880000	3820000	840000	2980000	4140	2180	1960
Tall Oil and Turpentine Refinery Pond Overflow (Arizona Chemical Co.)	4.4	45	1210	-	-	-	70	-	909000	192000	717000	1100	660	440
Salt Water Mill Influent	22.9	-	291	-	5730	-	-	2290000	4460000	1420000	3040000	1780	1130	650
Fresh (Well) Water Mill Influent	14.3	-	-	-	596	-	-	3100	38800	14000	24800	-	-	-

** Cr_2O_7 All figures based on all samples analyzed and are gross results.

Average figures for all sources are based on 24-hour composite samples. The number of daily composited samples collected from each source varied from 4 to 16.

Source and characteristics of component wastes are discussed in subsequent paragraphs.

Evaporator Condenser Effluent (Salt Water) - This waste consists of salt water employed in barometric jet condensers for the black liquor evaporators. Dissolved gases and liquor carry-over are responsible for the B.O.D. of this waste. The waste, as sampled, also contained turpentine surface condenser cooling water. It was found that this cooling water accounted for only 0.1 of 1 per cent of the 5-day B.O.D. of the combined waste. B.O.D. concentrations of the combined waste varied from 33 to 153 ppm. Daily concentrations of all constituents varied considerably. Increases in B.O.D. and color concentrations occurred simultaneously, indicating that carry-over of black liquor, or black liquor losses during evaporator boilouts for scale removal, were chiefly responsible for the 5-day B.O.D.

Turpentine Surface Condenser Cooling Water - Vapors released from the digesters during cooking are condensed, using surface type condensers. The cooling water from the condensers constitutes this waste. The waste was sampled separately and after combining with evaporator condenser salt water. Table 3 is presented to show the percentage of constituents of the combined waste that are due to each of the two components.

Table 3 - Average Quantity and Percentage of Waste Constituents of Each Component of Evaporator Condenser Salt Water and Turpentine Surface Condenser Cooling Water

Source	Discharge	Immediate Oxygen Demand	Biochemical Oxygen Demand	Corrected Oxygen Consumed *	Color	Lignin & Tannin as Tannic Acid	Sulfides as S	Chlorides as Cl	Solids					
									Total Solids			Suspended Solids		
									Total	Volatile	Fixed	Total	Volatile	Fixed
	MGD	Pounds							Pounds per Day					
Evaporator condenser effluent (salt water) and turpentine surface condenser cooling water (salt water)	24.3	2840	16300	25300	26500	18800	2630	2001000	4350000	1170000	3180000	19800	15500	4300
Turpentine surface condenser cooling water (salt water)	3.6	6	18	-	960	30	-	321000	668000	162000	506000	1360	740	620
Difference (evaporator condenser effluent [salt water])	20.7	2830	16280	25300	25540	18770	2630	1680000	3682000	1008000	2674000	18440	14760	3680
Per cent of constituents in total discharge due to turpentine surface condenser cooling water (salt water)	15	0.21	0.11	-	3.6	0.16	-	16	15	14	16	7	5	14
Per cent of constituents in total discharge due to evaporator condenser effluent (salt water)	85	99.8	99.9	100	96.4	99.8	100	84	85	86	84	93	95	86

Samples were collected from both sources on 4 days only (4/7, 4/8, 4/9, 4/10). Above figures are based on average values obtained from these samples.

* Cr_2O_7

Woodyard Sewer - Water used as lubricant on the chains of the log conveyors constitutes this waste. The water used in this phase of the process is pulp mill white water (decker seal pit water). This waste contains bark, wood particles, and soil, that are loosened from the logs during conveying.

Pulp Mill White Water to Log Conveyors - This waste was sampled so that corrections could be applied to values of constituents of the woodyard sewer, thereby giving results that are due entirely to the log conveying operation. Table 4 gives the net values of constituents due to log conveying.

Table 4 - Average Quantity of Waste Constituents in Wood Yard Sewer Due to Log Conveying

Source	Discharge	Immediate Oxygen Demand	Biochemical Oxygen Demand	Corrected Oxygen Consumed *	Color	Lignin & Tannin as Tannic Acid	Chlorides as Cl	Solids					
								Total Solids			Suspended Solids		
								Total	Volatile	Fixed	Total	Volatile	Fixed
	MGD	Pounds per Day											
Wood yard sewer	0.47	168	2070	6880	2280	1400	74	8090	4900	3190	3190	3020	170
Pulp mill white water to log conveyors	0.47	59	942	2800	1760	490	121	4830	1830	3000	600	535	65
Difference (lb/day)		109	1130	4090	520	910	-47	3260	3070	190	2590	2485	105
Per cent increase due to log conveying		185	120	146	30	186	-39	67	169	6	432	464	162

Samples were collected from both sources on 4 days only (4/7, 4/8, 4/9, 4/10).
Above figures are based on average values obtained from these 4 samples.
(-) indicates a decrease.

* Cr_2O_7

Paper Mill Effluent - This waste was made up of intermittent overflows from the wire and seal pits, paper mill wash-up and overflow from the filtered white water chests. Discharge varied considerably, as did all of the constituents. Suspended volatile solids values were high, indicating appreciable fiber content. Values obtained varied from 4,720 to 17,100 pounds of suspended volatile solids per day.

Pulp Mill Surface Ditch - Components of this waste included leaks and spills from around Cottrell precipitators, black liquor storage tanks, bark burner water feed pump packing gland, and other low-volume intermittent flows. The most significant quantities of this waste are the high color and solids concentrations. Values of pH determinations were consistently high and exceeded 10.0 on six of the eleven samples analyzed.

Caustic Room and Mud Filter Room Sewers - These wastes included wash-ups and any spillages and leakages from the caustic room and lime kiln operations. The combined waste was highly alkaline. The pH exceeded 11.5 in all eleven samples analyzed. Solids concentrations varied from 2,410 to 15,600 ppm. Discharge was intermittent and variable. B.O.D. quantities varied from 55 to 471 pounds per day. The high and low values for B.O.D. occurred simultaneously with high and low solids concentrations. Extreme values for all analyses were not indicative of normal wastes from this source.

Total Pulp Mill Effluent - This effluent is a combined waste consisting of overflow from the blow heat accumulator, overflow from the decker seal pit, recovery room wastes and turpentine separator underflow. Two of the wastes were also sampled separately. Table 5 is presented to show the quantities of constituents attributable to each source. Discharge remained reasonably constant but concentrations of most constituents varied considerably.

Table 5 - Average Quantity and Percentage of Waste Constituents of Components of Total Pulp Mill Effluent

Source	Discharge	Immediate Oxygen Demand	Biochemical Oxygen Demand	Corrected Oxygen Consumed *	Color	Lignin & Tannin as Tannic Acid	Sulfides as S	Chlorides as Cl	Solids					
									Total Solids			Suspended Solids		
									Total	Volatile	Fixed	Total	Volatile	Fixed
	MGD	Pounds							per			Day		
Total pulp mill effluent:	7.10	1240	22800	63900	49700	9060	290	710	98700	33600	65100	11700	10510	1190
Recovery room effluent	0.24	408	1770	7020	13100	1980	146	254	13130	4080	9050	469	368	101
Turpentine separator underflow	0.058	112	2880	3440	150	721	36	653	1400	370	1030	5	4	1
Blow heat accumulator, and decker seal pit overflows (combined discharge) (by difference)	6.80	720	18200	53400	36400	6360	108	0	84200	29200	55000	11200	10100	1100
Per cent of constituents in total pulp mill effluent due to recovery room effluent	3.4	33	7.8	11	26	22	50	36	13	12	14	4.0	3.5	8.5
Per cent of constituents in total pulp mill effluent due to turpentine separator underflow	0.8	9	13	5	0.3	8	12	92	1.4	1.1	1.6	0.04	0.04	0.08
Per cent of constituents in total pulp mill effluent due to combined discharge of blow heat accumulator overflow and decker seal pit overflow	96	58	79	84	74	70	30	0	86	87	84	96	96	91

Above figures based on average values of all samples from each source.

* Cr_2O_7

Recovery Room Effluent - Components of this waste include leaks and spills from black liquor storage tanks, pump leakage, and other unidentified waste flows. Variations in concentrations of all constituents were tremendous. Color ranged from 1,500 to 17,500 ppm, indicating black liquor presence. B.O.D. quantities averaged 1,770 pounds per day, with a range from 596 to 4,870 pounds per day. Sulfides averaged 73 ppm and pH values varied from 10.7 to 12.2. The cause of the extreme range of the various constituents has not been determined. However the average flow was only 164 gallons per minute.

Turpentine Separator Underflow - After the relief vapors have been condensed, the water present is removed from the turpentine by gravity separation. Turpentine, having a lower specific gravity than water, floats on the surface while the water is continuously withdrawn from below the turpentine level. This effluent contains dissolved organic components, including some turpentine. The B.O.D. concentration of this waste was the highest encountered from any source during the survey. Sulfide concentrations averaged 74 ppm, which was responsible for the immediate oxygen demand. The flow averaged only 40 gallons per minute.

Crude Tall Oil Plant and Cinder Pond Effluents - Crude tall oil plant wastes, and cinders from the bark burners, suspended in pulp mill white water, are combined after each component passes through separate settling ponds. The combined effluent is discharged to Bayou Chico Ditch. B.O.D. values were low, but solids concentrations were high. The tall oil pond influent and effluent were also sampled separately. The characteristics of the cinder pond effluent were obtained by difference Table 6 presents the percentage of constituents of the combined waste that are due to each of the two components.

Table 6 - Average Quantity and Percentage of Waste Constituents of Each Component of the Tall Oil and Cinder Pond Effluent

Source	Discharge	Immediate Oxygen Demand	Biochemical Oxygen Demand	Corrected Oxygen Consumed *	Color	Lignin & Tannin as Tannic Acid	Chlorides as Cl	Solids					
								Total Solids			Suspended Solids		
								Total	Volatile	Fixed	Total	Volatile	Fixed
	MGD	Pounds						Per Day					
Crude tall oil plant and cinder pond effluents	0.181	20	370	1020	284	-	121	5840	780	5060	79	57	22
Crude tall oil pond effluent	0.064	56	453	1260	220	560	89	5240	790	4450	474	471	3
Difference (cinder pond effluent)	0.117	-36	-83	-240	64	-	31	600	-10	-610	-395	-414	19
Per cent of constituents in total effluent due to crude tall oil plant pond effluent	35	-	-	-	77	-	74	90	-	88	-	-	14
Per cent of constituents in total effluent due to cinder pond effluent	65	-	-	-	23	-	26	10	-	12	-	-	86
Crude tall oil plant pond influent	0.064	75	1340	3790	227	560	150	5100	2170	2930	1240	1230	10
Crude tall oil plant pond effluent	0.064	56	453	1260	220	560	89	5240	790	4450	474	471	3
Difference	-	19	887	2530	7	-	61	-140	1380	-1520	766	759	7
Per cent decrease of constituents due to retention in crude tall oil plant pond	-	25	66	67	3.1	-	41	-	64	-	62	62	70

Samples were collected from both sources on 4 days only (4/7, 4/8, 4/9, 4/10). Above figures are based on average values obtained from these 4 samples.

* Cr_2O_7

Bayou Chico Effluent - All process wastes except salt water wastes from powerhouse turbines and oil coolers are discharged to Bayou Chico, which has a retention capacity of about seven days. Table 7 lists the total characteristics of Bayou Chico effluent. Actual differences between the total of the components and the final effluent are also presented.

TABLE 7 - AVERAGE QUANTITIES OF CONSTITUENTS OF COMPONENT WASTES AND BAYOU CHICO EFFLUENT

Source	Discharge MGD	Immediate Oxygen Demand	Biochemical Oxygen Demand	Corrected ** Oxygen Consumed	Color	Lignin & Tannin as Tannic Acid	Sulfides as S	Chlorides as Cl	Solids					
									Total Solids			Suspended Solids		
									Total	Volatile	Fixed	Total	Volatile	Fixed
		lbs/day												
Evaporator Condenser Effluent (Salt Water) and Turpentine Surface Condenser Cooling Water (Salt Water)	23.8	2780	15000	22400	22800	12900	3180	2320000	4630000	1460000	3170000	15900	12600	3300
Wood Yard Sewer	0.48	116	2100	7400	2300	1000	-	116	7970	4860	3110	3100	2870	230
Pulp Mill Surface Ditch	0.13	43	554	-	2350	400	3	-	3100	1360	1740	416	314	102
Caustic Room and Mud Filter Room Sewers	0.063	167	214	-	-	-	109	-	2930	490	2440	403	222	181
Total Pulp Mill Effluent	7.10	1240	22800	63900	49700	9060	290	710	98700	33600	65100	11700	10510	1190
Crude Tall Oil Plant and Cinder Pond Effluents	0.207	20	490	1080	380	-	-	126	8860	940	7920	128	102	26
Paper Mill Effluent	4.0	23	4190	17100	1740	734	-	1770	33800	12300	21500	8680	8293	387
Total of Above Components	35.8	4390	45300	112000	79300	24100	3580	2320000	4780000	1510000	3270000	40300	34900	5400

TABLE 7 - AVERAGE QUANTITIES OF CONSTITUENTS OF COMPONENT WASTES AND BAYOU CHICO EFFLUENT (Continued) - 2

Source	Discharge MGD	Immediate Oxygen Demand	Biochemical Oxygen Demand	Corrected ** Oxygen Consumed	Color	Lignin & Tannin as Tannic Acid	Sulfides as S	Chlorides as Cl	Solids					
									Total Solids			Suspended Solids		
									Total	Volatile	Fixed	Total	Volatile	Fixed
		lbs/day												
Combined Mill Effluent (Bayou Chico Effluent)	34.2	7420	43000	71300	31400	23400	7420	2290000	4970000	1310000	3660000	27300	21410	5890
Difference	-1.6	+3030	-2300	-40700	-47900	-700	+3840	- 40000	+190000	-200000	+390000	-13000	-13500	+490
Per Cent Increase or Decrease Due to Retention in Bayou Chico	-4.5	+69	-5.1	-36	-60	-2.9	+107	-1.7	+4.0	-13	+12	-32	-39	+9

* - Increase
-- Decrease
** Cr_2O_7

Above figures based on all data collected during the survey.

Salt Water Ditch - Wastes discharged to this ditch include powerhouse condenser salt water and tall oil and turpentine refinery pond overflow from Arizona Chemical Company. Table 8 shows the percentage of each constituent attributable to each waste.

TABLE 8 - AVERAGE QUANTITY AND PERCENTAGE OF WASTE CONSTITUENTS OF EACH COMPONENT OF THE SALT WATER DITCH

Source	Discharge M.G.D.	Immediate Oxygen Demand lbs/day	Biochemical Oxygen Demand lbs/day	Sulfides as S lbs/day	Solids					
					Total Solids			Suspended Solids		
					Total	Volatile	Fixed	Total	Volatile	Fixed
					lbs/day					
Salt Water Ditch	17.8	136	1190	237	38200000	840000	2980000	4140	2180	1960
Tall Oil and Turpentine Refinery Pond Overflow (Arizona Chemical Company)	4.4	45	1210	70	909000	192000	717000	1100	660	440
Difference (Power Plant Effluent [Salt Water])	13.4	91	-20	167	37300000	648000	2260000	3040	1520	1520
Per Cent of Constituents in Salt Water Ditch due to Power Plant Effluent (Salt Water) (International Paper Company)	75.3	67	0	70	98	77	76	73	70	78
Per Cent of Constituents in Salt Water Ditch Due to Tall Oil and Turpentine Refinery Pond Overflow (Arizona Chemical Company)	24.7	33	100	30	2	23	24	27	30	22

Above figures based on all data collected during the survey.

In determining the total waste load of the mill, two sets of data are available. One set of data was obtained by sampling and measuring Bayou Chico effluent. Another group of data was obtained by sampling and measuring all component wastes contributing to this effluent.

The total flow of the component wastes exceeds the combined effluent by 4.5 per cent. This figure is within the accuracy of flow measurements. Comparison of the two sets of values of significant constituents revealed variable differences. The most important change was the sulfide content which increased 107 per cent. This increase was reflected in the immediate oxygen demand which increased 69 per cent. The 5-day B.O.D. decreased 5.1 per cent. The oxygen consumed value, which is a measure of the organic material present, decreased 36 per cent. Total solids increased 4.0 per cent, while total volatile solids decreased 13 per cent. These changes are undoubtedly due to physical, chemical and biological reactions that take place in the retention basin.

The figures obtained by totaling the constituents of the waste components are considered to be the most representative of process wastes, since they were collected and measured as near the source of discharge as possible. The samples collected from the Bayou Chico outfall were not considered representative of the total process wastes but rather of these total combined wastes after some degree of treatment.

Table 9 is presented to show net values of significant constituents. The average values of the constituents of the mill influent have been subtracted from the total of the average gross values of the waste components. The figures thus obtained are used in determining waste loads per unit production.

TABLE 9 - NET VALUES OF SIGNIFICANT CONSTITUENTS OF TOTAL WASTE COMPONENTS

Source	Discharge MGD	Immediate Oxygen Demand	Biochemical Oxygen Demand	Corrected Oxygen Consumed (Cr_2O_7)	Color	Lignin & Tannin as Tannic Acid	Sulfides as S	Chlorides as Cl	Solids					
									Total Solids			Suspended Solids		
									Total	Volatile	Fixed	Total	Volatile	Fixed
		lbs-day												
Total of all Waste Components Discharged to Bayou Chico	35.8	4390	45300	112000	79300	24100	3580	2320000	4780000	1510000	3270000	40300	34900	5400
Total of Fresh and Salt Water Mill Influent	37.2	-	290	-	6330	-	-	2290000	4500000	1430000	3070000	1780	1130	650
Difference Average Net Quantities of Significant Constituents	-1.4	4490	45000	112000	73000	24100	3580	30000	280000	80000	200000	38500	33800	4750

32. Quantity of Liquid Wastes Discharged

The average daily discharge of the total waste components amounted to 35.8 million gallons. Table 10 lists the waste components and daily flow characteristics.

TABLE 10

MAXIMUM, MINIMUM, AVERAGE, AND PERCENTAGE FLOW OF EACH COMPONENT OF TOTAL WASTE DISCHARGE *

Source	AVERAGE DAILY DISCHARGE Million Gallons	Per Cent of Total	Minimum Daily Discharge Million Gallons	Maximum Daily Discharge Million Gallons
Evaporator Condenser Effluent (Salt Water) and Turpentine Surface Condenser Cooling Water (Salt Water)	23.8	66.5	19.9	25.9
Wood Yard Sewer	0.48	1.3	0.44	0.49
Pulp Mill Surface Ditch	0.13	0.4	0.06	0.20
Caustic Room and Mud Filter Room Sewers	0.063	0.2	0.036	0.184
Total Pulp Mill Effluent	7.10	19.8	6.59	7.92
Crude Tall Oil Plant and Cinder Pond Effluent	0.207	0.6	0.152	0.382
Paper Mill Effluent	4.0	11.2	2.9	5.2
Total of Above Components	35.8	100.0	30.1	40.3

Extreme flows from above sources did not occur concurrently on any day during the survey.

* Does not include salt water ditch.

33. Quantity of Significant Constituents

Total pounds of constituents discharged from the plant daily are given in Table 11.

TABLE 11

TOTAL POUNDS OF CONSTITUENTS DISCHARGED DAILY *

Constituent	Total Pounds in Waste Components **
Immediate Oxygen Demand	4,490
B.O.D., 5-Day, 20° C.	45,000
Corrected Oxygen Consumed (Cr_2O_7)	112,000
Color	73,000
Lignin and Tannin as Tannic Acid	24,100
Sulfides as S	3,580
Chlorides as Cl	30,000
Total Solids	280,000
Total Volatile Solids	80,000
Total Fixed Solids	200,000
Total Suspended Solids	38,500
Suspended Volatile Solids	33,800
Suspended Fixed Solids	4,750
Total Dissolved Solids	242,000

* Does not include salt water ditch.

** Net values.

34. Waste Constituents per Unit Production

Paperboard production for the 16 sampling days averaged 1,300 tons per day. Quantities of waste constituents per one ton unit of paperboard production based on net waste load of components is given in Table 12. This table also gives the unit values based on total waste components and on Bayou Chico effluent.

TABLE 12

QUANTITY OF WASTE CONSTITUENTS PER TON OF PAPERBOARD PRODUCED

(1) Based on Individual Waste Components
(2) Based on Total Waste Components
(3) Based on Total Mill Effluent

Source	Discharge: Gallons Per Ton of Paperboard Production	Discharge: Per Cent of Total	BOD 5-day 20° C.: Pounds Per Ton of Paperboard Production	BOD 5-day 20° C.: Per Cent of Total	Suspended Solids: Pounds Per Ton of Paperboard Production	Suspended Solids: Per Cent of Total
(Evaporator Condenser Effluent [Salt Water])	15,500	41.0	° 11.33	32.6	° 10.00	32.4
(Turpentine Surface Condenser Cooling Water [Salt Water])	2,760	7.3	°L- 0.1	0.0	° 0.84	2.7
(Wood Yard Sewer	370	1.0	1.62	4.7	2.38	7.7
(Paper Mill Effluent	3,080	8.2	3.22	9.3	6.68	21.6
(Pulp Mill Surface Ditch	100	0.3	0.45	1.3	0.32	1.0
(1) (Caustic Room and Mud Filter Room Sewers	48	0.1	0.16	0.4	0.31	1.0
(Turpentine Separator Underflow	45	0.1	2.22	6.4	0.00	0.0
(Recovery Room Effluent	185	0.5	1.36	3.9	0.36	1.1
(Blow Heat Accumulator Overflow and Decker Seal Pit Overflow	5,230	13.8	14.00	40.3	8.62	27.9
(Crude Tall Oil Plant and Cinder Pond Effluents	159	0.4	0.38	1.1	0.10	0.3
(Power Plant Effluent [Salt Water])	10,300	27.3	L- 0.1	0.0	1.32	4.3
(2) Total	37,800	100.0	° 34.7	100.0	° 30.9	100.0
(3) (Bayou Chico Effluent and Power Plant Effluent [Salt Water]) (Total Mill Effluent)	36,600		° 32.8		° 22.5	

° Net results, quantities in mill influent have been subtracted.

Daily data summary sheets for all sample points are included in the Appendix of this report.

APPENDIX

DICHROMATE REFLUX METHOD FOR DETERMINATION OF OXYGEN CONSUMED

Special Apparatus

Reflux apparatus, consisting of a 300-ml round-bottomed flask with a 24/40 taper-joint neck connected with a Friedrich's reflux condenser.

Reagents and Solutions

1. Potassium dichromate, 0.2500 N
2. Sulfuric acid, concentrated
3. Ferrous ammonium sulfate, 0.2500 N
4. Indicator, O-phenanthroline ferrous complex

Procedure

1. Dilute an appropriate amount of sample to 50 ml with distilled water in a 300-ml round-bottomed flask with a taper-joint neck.
2. Add 25.0 ml of 0.2500 N potassium dichromate and 75 ml of concentrated sulfuric acid. For the best quantitative results, use 50% by volume sulfuric acid.
3. Reflux for two hours.
4. Cool, transfer the mixture, to an Erlenmeyer flask and titrate the excess potassium dichromate with approximately 0.2500 N ferrous ammonium sulfate, using O-phenanthroline ferrous complex as an indicator.
5. Reflux a blank at the same time, using the same amount of reagents and substituting 50 ml of distilled water for the sample.
6. The ferrous ammonium sulfate must be standardized daily.

Calculations

$$\text{O.C., ppm} = \frac{(a-b) \times \text{normality (standard Fe)} \times 8000}{\text{volume of sample}}$$

where O.C. = oxygen consumed

a = ml of ferrous ammonium sulfate used for blank

b = ml of ferrous ammonium sulfate used for sample

Chloride Correction

In the oxidation of chlorides with dichromate in a strongly acid solution, the following reaction is assumed to take place:

$$2\ Cl^- + O \longrightarrow Cl_2 + O^=$$

The atomic weight of chlorine is 35.46; for the oxidation of 2 x 35.46 or 70.92 grams, it will require 16 grams of oxygen. For the oxidation of 1 gram of chloride, of 1 ppm, it will require 16/70.92 or 0.226 grams or ppm of oxygen.

Example:

Cl^-	667 ppm	
Oxygen consumed	186 "	
667 x 0.226	154 "	(or O.C. equivalent of chlorine)
Oxygen consumed due to organic	32 "	

Combined Mill Effluent
Sample Point Number 1, (Bayou Chico Effluent)

Date 1952	Lab. No.	Discharge			B.O.D. 5-day, 20°C		IOD	pH	Acid. or Alk.	Sulfides as S	Lignins & Tannins as Tannic Acid	Corrected Oxygen Consumed (Cr_2O_7)	Chlorides as Cl
		cfs	GPM	MGD	ppm	lb/day	ppm		ppm	ppm	ppm	ppm	ppm
3/17	1-1	57.3	25700	37.0	176	54300	22	7.6	0 P 185 T	35	60	368	9400
3/18	1-2	53.0	23800	34.2	172	49000	46	6.9	0 P 218 T	48	120	340	9400
3/19	1-3	54.0	24200	34.9	172	50000	24	7.0	0 P 189 T	45	110	272	9280
3/20	1-4	54.0	24200	34.9	170	49500	37	7.0	0 P 166 T	37	56	222	9700
3/24	1-5	51.3	23000	33.1	135	37300	21	7.4	0 P 162 T	4	70	251	8340
3/25	1-6	53.0	23800	34.2	133	37900	26	7.5	0 P 173 T	27	56	137	9200
3/26	1-7	53.5	24000	34.6	154	44400	26	6.7	0 P 169 T	10	70	153	9100
3/27	1-8	54.6	24500	35.3	144	42400	22	6.6	0 P 142 T	22	60	253	8460
3/31	1-9	51.0	22900	32.9	162	44400	26	6.9	0 P 175 T	26	82	265	7440
4/1	1-10	49.1	22000	31.7	-	-	-	-	- - - -	35	—	135	6780
4/2	1-11	51.8	23300	33.5	156	43600	17	7.2	0 P 162 T	26	90	204	6600
4/3	1-12	53.0	23800	34.2	147	41900	20	7.3	0 P 165 T	3	100	585	6800
4/7	1-13	50.3	22600	32.5	152	41200	37	7.3	0 P 165 T	31	88	255	7340
4/8	1-14	54.0	24200	34.9	128	37200	25	7.2	0 P 157 T	29	65	157	7360
4/9	1-15	53.6	24100	34.6	132	38100	24	7.6	0 P 162 T	22	122	180	7080
4/10	1-16	53.8	24200	34.8	118	34200	21	7.0	0 P 153 T	10	88	229	6300
Mean		53.0	23800	34.2	150	43000	26	-	- - - -	26	82	250	8040
Min.		49.1	22000	31.7	118	34200	17	6.6	0 P 142 T	3	56	135	6300
Max.		57.3	25700	37.0	176	54300	46	7.6	0 P 218 T	48	122	585	9700

Combined Mill Effluent

Sample Point Number 1,(Bayou Chico Effluent)

Lab. No.	Date 1952	Color ppm	TOTAL SOLIDS						SUSPENDED SOLIDS					
			Total		Volatile		Fixed		Total		Volatile		Fixed	
			ppm	lbs/day	ppm	lbs/day	ppm	lbs/day	ppm	lbs/day	ppm	lbs/day	ppm	lbs/day
1-1	3/17	80	18100	5580000	2980	920000	15120	4660000	86	26500	78	24000	8	2500
1-2	3/18	100	18500	5280000	3680	1050000	14820	4230000	118	33600	96	27300	22	6300
1-3	3/19	100	18100	5270000	3720	1090000	14380	4180000	172	50100	116	33800	56	16300
1-4	3/20	100	18200	5300000	2910	850000	15290	4450000	106	30800	106	30800	-	-
1-5	3/24	100	16200	4470000	3360	930000	12840	3540000	78	21500	78	21500	-	-
1-6	3/25	75	17100	4880000	3050	870000	14050	4010000	62	17700	50	14300	12	3400
1-7	3/26	60	30800	8890000	16700	4820000	14100	4070000	50	14400	44	12700	6	1700
1-8	3/27	75	18500	5450000	4760	1410000	13740	4040000	84	24700	62	18200	22	6500
1-9	3/31	150	14600	4010000	2460	680000	12140	3330000	156	42800	104	28500	52	14300
1-10	4/1	200	15500	4100000	4410	1170000	11090	2930000	90	23800	70	18500	20	5300
1-11	4/2	150	14000	3910000	3270	910000	10730	3000000	86	24000	60	16700	26	7300
1-12	4/3	125	13500	3850000	2030	580000	11470	3270000	88	25100	66	18800	22	6300
1-13	4/7	150	14500	3930000	2500	680000	12000	3250000	116	31400	82	22200	34	9200
1-14	4/8	100	23300	6780000	11600	3380000	11700	3400000	86	25000	62	18000	24	7000
1-15	4/9	100	13900	4010000	2760	800000	11140	3210000	80	23100	63	18200	17	4900
1-16	4/10	100	13100	3800000	2730	790000	10370	3010000	78	22600	67	19400	11	3200
Mean		110	17400	4970000	4600	1310000	12800	3660000	96	27300	75	21410	21	5890
Minimum		60	13100	3800000	2030	580000	10370	2930000	50	14400	44	12700	-	-
Maximum		200	30800	8890000	16700	4820000	15290	4660000	172	50100	116	33800	56	16300

Sample Point Number 2, Salt Water Ditch

Date 1952	Lab. No.	Discharge			B.O.D. 5-day, 20°C		IOD	pH	Acid. or Alk.	Sulfides as S	Corrected Oxygen Consumed (Cr_2O_7)	Chlorides as Cl
		cfs	GPM	MGD	ppm	lb/day	ppm		ppm	ppm	ppm	ppm
3/17	2-1	27.6	12400	17.8	6.0	891	0.25	7.5	0 P 102 T	0.8	L-1	14400
3/18	2-2	27.5	12400	17.8	6.7	995	0.30	7.6	0 P 104 T	1.5	L-1	14600
3/19	2-3	26.6	11900	17.2	6.1	875	0.20	7.5	0 P 96 T	0.8	L-1	14500
3/20	2-4	25.7	11500	16.6	4.9	678	0.50	7.6	0 P 94 T	1.1	L-1	14800
3/24	2-5	28.4	12800	18.3	8.6	1310	0.12	7.8	0 P 96 T	1.7	L-1	12400
3/25	2-6	27.5	12300	17.8	7.9	1170	0.08	8.0	9.6 P 98 T	1.8	L-1	13300
3/26	2-7	27.5	12300	17.8	7.6	1130	0.08	7.4	0 P 100 T	1.7	53	12600
3/27	2-8	28.4	12800	18.3	4.0	610	0.46	7.6	0 P 96 T	1.2	L-1	12200
3/31	2-9	31.2	14000	20.2	15.0	2530	3.00	8.1	10.6 P 113 T	2.8	31	11000
4/1	2-10	29.3	13200	18.9	-	-	-	-	- - - -	2.5	-	10700
4/2	2-11	25.7	11500	16.6	15.0	2080	0.00	7.9	0 P 108 T	2.5	L-1	11200
4/3	2-12	25.7	11500	16.6	5.9	817	5.10	8.3	12.6 P 103 T	1.0	L-1	10900
Mean		26.5	12400	17.8	8.0	1190	0.92	-	- - - -	1.6	-	12700
Min.		25.7	11500	16.6	4.0	610	0.0	7.4	0 P 94 T	0.8	L-1	10700
Max.		31.2	14000	20.2	15.0	2530	5.10	8.3	12.6 P 113 T	2.8	53	14800

Sample Point Number 2, Salt Water Ditch

Lab. No.	Date 1952	TOTAL SOLIDS						SUSPENDED SOLIDS					
		Total		Volatile		Fixed		Total		Volatile		Fixed	
		ppm	lbs/day	ppm	lbs/day	ppm	lbs/day	ppm	lbs/day	ppm	lbs/day	ppm	lbs/day
2-1	3/17	29000	4300000	5700	840000	23300	3460000	11	1630	9	1340	2	290
2-2	3/18	29300	4350000	6180	920000	23120	3430000	16	2380	10	1490	6	890
2-3	3/19	-	-	-	-	-	-	35	5020	18	2580	17	2440
2-4	3/20	29500	4080000	6580	910000	22920	3170000	15	2080	12	1670	3	410
2-5	3/24	25000	3820000	4880	750000	20120	3070000	14	2140	12	1830	2	310
2-6	3/25	24800	3680000	4440	660000	20360	3020000	28	4160	14	2080	14	2080
2-7	3/26	31500	4680000	10400	1550000	21100	3130000	22	3260	12	1780	10	1480
2-8	3/27	24300	3710000	4830	740000	19470	2970000	21	3200	10	1530	11	1670
2-9	3/31	21200	3570000	3540	590000	17660	2980000	74	12500	30	5090	44	7410
2-10	4/1	-	-	-	-	-	-	-	-	-	-	-	-
2-11	4/2	21600	2990000	3880	540000	17720	2450000	50	6920	25	3460	25	3460
2-12	4/3	21700	3000000	6200	860000	15500	2140000	16	2220	8	1110	8	1110
Mean		25800	3820000	5700	840000	20100	2980000	27	4140	14	2180	13	1960
Minimum		21200	2990000	3540	540000	15500	2140000	11	1630	8	1110	2	290
Maximum		31500	4680000	10400	1550000	23300	3460000	74	12500	30	5090	44	7410

Sample Point Number 2B, Tall Oil and Turpentine Refinery Pond Overflow (Arizona Chemical Company)

Date 1952	Lab. No.	Discharge			B.O.D. 5-day, 20°C		IOD	pH	Acid. or Alk.	Sulfides as S
		cfs	GPM	MGD	ppm	lb/day	ppm		ppm	ppm
3/17	2B-1	6.9	3100	4.4	18	661	0.20	7.4	0 P 97 T	1.8
3/18	2B-2	7.5	3370	4.8	22	881	0.0	7.3	0 P 104 T	2.0
3/19	2B-3	7.8	3500	5.0	19	792	0.0	7.3	0 P 95 T	1.4
3/20	2B-4	7.8	3500	5.0	18	751	0.0	7.2	0 P 92 T	1.2
3/24	2B-5	7.2	3230	4.6	27	1040	0.70	7.3	0 P 96 T	2.5
3/25	2B-6	6.7	3010	4.3	26	932	0.70	7.5	0 P 100 T	2.2
3/26	2B-7	6.2	2780	4.0	26	867	0.90	7.2	0 P 102 T	2.6
3/27	2B-8	6.2	2780	4.0	13	434	0.84	7.4	0 P 97 T	1.4
3/31	2B-9	7.3	3280	4.7	46	1800	2.90	7.5	0 P 94 T	1.5
4/1	2B-10	6.9	3100	4.4	-	-	-	-	- - - -	2.7
4/2	2B-11	6.4	2870	4.1	60	2050	0.0	7.6	0 P 106 T	1.2
4/3	2B-12	5.6	2510	3.6	104	3120	7.20	7.4	0 P 124 T	3.0
Mean		6.9	3100	4.4	34	1210	1.22	-	- - - -	1.9
Min.		5.6	2510	3.6	13	434	0.0	7.2	0 P 92 T	1.2
Max.		7.8	3500	5.0	104	3120	7.20	7.6	0 P 124 T	3.0

Sample Point Number 2B, Tall Oil and Turpentine Refinery Pond Overflow (Arizona Chemical Company)

Lab. No.	Date 1952	TOTAL SOLIDS						SUSPENDED SOLIDS					
		Total		Volatile		Fixed		Total		Volatile		Fixed	
		ppm	lbs/day	ppm	lbs/day	ppm	lbs/day	ppm	lbs/day	ppm	lbs/day	ppm	lbs/day
2B-1	3/17	26800	984000	4380	161000	22420	823000	14	514	12	441	2	73
2B-2	3/18	28100	1120000	5910	232000	22190	888000	42	1680	30	1200	12	480
2B-3	3/19	27100	1130000	5270	220000	21830	910000	14	584	10	417	4	167
2B-4	3/20	33700	1400000	11400	470000	22300	930000	12	500	11	458	1	42
2B-5	3/24	22700	871000	4000	154000	18700	717000	18	690	12	460	6	230
2B-6	3/25	24400	875000	4520	162000	19880	713000	27	968	14	502	13	466
2B-7	3/26	26000	867000	5950	198000	20050	669000	28	934	16	534	12	400
2B-8	3/27	23800	794000	5070	169000	18730	625000	22	734	16	534	6	200
2B-9	3/31	17700	694000	2890	114000	14810	580000	70	2740	31	1210	39	1530
2B-10	4/1	-	-	-	-	-	-	-	-	-	-	-	-
2B-11	4/2	19000	650000	2960	102000	16040	548000	50	1710	26	890	24	820
2B-12	4/3	20500	615000	4390	131000	16110	484000	-	-	-	-	-	-
Mean		24500	909000	5100	192000	19400	717000	30	1100	18	660	12	440
Minimum		17700	615000	2890	102000	14810	484000	12	500	10	417	1	42
Maximum		33700	1400000	11400	470000	22420	930000	70	2740	31	1210	39	1530

Sample Point Number 3, Evaporator Condenser Effluent (Salt Water) and Turpentine Surface Condenser Cooling Water (Salt Water)

Date 1952	Lab. No.	Discharge			B.O.D. 5-day 20°C		IOD	pH	Acid. or Alk.	Sulfides as S	Lignins & Tannins as Tannic Acid	Corrected Oxygen Consumed (Cr_2O_7)	Chlorides as Cl	Color
		cfs	GPM	MGD	ppm	lb/day	ppm		ppm	ppm	ppm	ppm	ppm	ppm
3/17	3-1	30.8	13800	19.9	153	25400	24	7.4	0 P 147 T	22	70	408	14100	160
3/18	3-2	33.3	14900	21.5	109	19500	26	6.7	0 P 119 T	20	100	358	14000	120
3/19	3-3	34.3	15400	22.2	76	14100	12	6.5	0 P 80 T	16	60	102	13800	80
3/20	3-4	31.1	14000	20.1	98	16400	42	7.0	0 P 122 T	20	50	8	14600	125
3/24	3-5	39.4	17700	25.5	48	10200	4.7	7.0	0 P 71 T	17	60	L-1	12600	60
3/25	3-6	39.1	17600	25.3	70	14800	7	7.9	0 P 89 T	16	40	170	12600	100
3/26	3-7	39.0	17500	25.2	54	11300	9.3	6.5	0 P 68 T	14	50	47	12600	60
3/27	3-8	37.9	17000	24.5	52	10600	11	6.5	0 P 50 T	19	28	38	12100	60
3/31	3-9	39.9	17900	25.8	79	17000	17	6.6	0 P 75 T	17	50	28	10800	120
4/1	3-10	34.0	15300	22.0	-	-	-	-	- - - -	22	-	L-1	10200	200
4/2	3-11	40.1	18000	25.9	57	12300	0	6.8	0 P 70 T	12	50	147	9600	125
4/3	3-12	39.0	17500	25.2	43	9040	0.33	6.7	0 P 58 T	6	40	L-1	10200	75
4/7	3-13	36.2	16200	23.4	57	11100	12	6.8	0 P 59 T	18	50	58	10400	75
4/8	3-14	37.1	16700	24.0	104	20800	15	7.0	0 P 69 T	15	40	33	10500	100
4/9	3-15	38.5	17300	24.9	127	26400	19	8.6	29 P 201 T	8	240	380	9700	250
4/10	3-16	38.7	17400	25.0	33	6880	9	6.6	0 P 69 T	10	42	30	9000	100
Mean		36.8	16500	23.8	77	15000	14	-	- - - -	16	65	113	11700	115
Min.		30.8	13800	19.9	33	6880	0	6.5	0 P 50 T	6	28	L-1	9000	60
Max.		40.1	18000	25.9	153	26400	42	8.6	29 P 201 T	22	240	408	14600	250

Sample Point Number 3, Evaporator Condenser Effluent (Salt Water) and Turpentine Surface Condenser Cooling Water (Salt Water)

Lab. No.	Date 1952	TOTAL SOLIDS						SUSPENDED SOLIDS					
		Total		Volatile		Fixed		Total		Volatile		Fixed	
		ppm	lbs/day	ppm	lbs/day	ppm	lbs/day	ppm	lbs/day	ppm	lbs/day	ppm	lbs/day
3-7	3/26	24400	5130000	7200	1520000	17200	3610000	44	9250	42	8830	2	420
3-8	3/27	23100	4720000	7880	1610000	15220	3110000	46	9400	34	6950	12	2450
3-9	3/31	21200	4560000	6570	1410000	14630	3150000	48	10300	40	8580	8	1720
3-10	4/1	33800	6200000	18300	3360000	15500	2840000	134	24600	110	20200	24	4400
3-11	4/2	18900	4080000	5010	1080000	13890	3000000	50	10800	36	7780	14	3020
3-12	4/3	19900	4180000	4380	910000	15540	3270000	76	16000	58	12200	18	3800
3-13	4/7	22000	4290000	5240	1020000	16760	3270000	92	18000	59	11600	33	6400
3-14	4/8	20800	4160000	4480	890000	16320	3270000	66	13200	50	10000	16	3200
3-15	4/9	21600	4480000	6100	1260000	15500	3220000	130	27000	120	24900	10	2100
3-16	4/10	21500	4480000	7390	1540000	14110	2940000	100	20800	74	15400	26	5400
Mean		22700	4630000	7200	1460000	15500	3170000	79	15900	63	12600	16	3300
Minimum		18900	4080000	4380	890000	13890	2840000	44	9250	34	6950	2	420
Maximum		33800	6200000	18300	3360000	17200	3610000	134	27000	120	24900	33	6400

Sample Point Number 3D, Turpentine Surface Condenser Cooling Water (Salt Water)

Date 1952	Lab. No.	Discharge			B.O.D. 5-day, 20°C		IOD	pH	Acid. or Alk.		Sulfides as S	Lignins & Tannins as Tannic Acid	Corrected Oxygen Consumed (Cr_2O_7)	Chlorides as Cl
		cfs	GPM	MGD	ppm	lb/day	ppm		ppm		ppm	ppm	ppm	ppm
4/7	3D-13	5.57	2500	3.60	1.50	45	0	7.9	0 72	P T	L-0.1	Trace	L-1	11400
4/8	3D-14	5.57	2500	3.60	0.10	3	0.50	7.5	0 76	P T	L-0.1	1	L-1	11100
4/9	3D-15	5.57	2500	3.60	0.10	3	0.15	7.5	0 72	P T	L-0.1	1	L-1	10400
4/10	3D-16	5.57	2500	3.60	0.70	21	0.10	7.4	0 70	P T	L-0.1	1	L-1	9960
Mean		5.57	2500	3.60	0.60	18	0.19	-	- -	- -	L-0.1	1	L-1	10700
Min.		5.57	2500	3.60	0.10	3	0	7.4	0 70	P T	L-0.1	Trace	L-1	9960
Max.		5.57	2500	3.60	1.50	45	0.50	7.9	0 76	P T	L-0.1	1	L-1	11400

Sample Point Number 3D, Turpentine Surface
Condenser Cooling Water (Salt Water)

Lab. No.	Date 1952	Color ppm	TOTAL SOLIDS						SUSPENDED SOLIDS					
			Total		Volatile		Fixed		Total		Volatile		Fixed	
			ppm	lbs/day	ppm	lbs/day	ppm	lbs/day	ppm	lbs/day	ppm	lbs/day	ppm	lbs/day
3D-13	4/7	25	22900	687000	5090	152000	17810	535000	59	1770	29	870	30	900
3D-14	4/8	30	21800	654000	4540	136000	17260	518000	49	1470	30	900	19	570
3D-15	4/9	40	21200	636000	4850	145000	16350	491000	23	690	13	390	10	300
3D-16	4/10	35	23100	693000	7080	212000	16020	481000	51	1530	27	810	24	720
Mean		32	22200	668000	5400	162000	16800	506000	46	1360	25	740	21	620
Minimum		25	21200	636000	4540	136000	16020	481000	23	690	13	390	10	300
Maximum		40	23100	693000	7080	212000	17810	535000	59	1770	30	900	30	900

Sample Point Number 4, Wood Yard Sewer

Date 1952	Lab. No.	Discharge			B.O.D. 5-day, 20°C		IOD	pH	Acid. or Alk.	Sulfides as S	Lignins & Tannins as Tannic Acid	Corrected Oxygen Consumed (Cr_2O_7)	Chlorides as Cl
		cfs	GPM	MGD	ppm	lb/day	ppm		ppm	ppm	ppm	ppm	ppm
3/17	4-1	0.76	340	0.49	450	1840	26	8.5	0 P 185 T	L-0.1	160	1700	46
3/18	4-2	0.74	333	0.48	377	1510	20	6.5	0 P 178 T	L-0.1	150	1480	29
3/19	4-3	0.71	319	0.46	392	1500	44	6.4	0 P 145 T	L-0.1	200	1650	34
3/20	4-4	0.74	333	0.48	538	2150	49	6.2	0 P 110 T	L-0.1	225	2160	24
3/24	4-5	0.76	340	0.49	585	2390	15	6.6	0 P 96 T	-	208	2150	39
3/25	4-6	0.74	333	0.48	634	2540	20	7.5	0 P 153 T	-	275	2150	29
3/26	4-7	0.73	326	0.47	632	2480	36	6.2	0 P 108 T	-	200	2030	23
3/27	4-8	0.68	306	0.44	610	2240	32	6.1	0 P 110 T	-	188	2300	40
3/31	4-9	0.73	326	0.47	590	2310	22	6.2	0 P 112 T	-	220	1980	34
4/1	4-10	0.76	340	0.49	-	-	-	-	- -	-	-	-	-
4/2	4-11	0.76	340	0.49	528	2160	0	6.5	0 P 135 T	-	200	1920	29
4/3	4-12	0.76	340	0.49	508	2080	0	6.7	0 P 130 T	-	300	1280	32
4/7	4-13	0.74	333	0.48	558	2230	44	6.5	0 P 100 T	-	250	1630	26
4/8	4-14	0.70	312	0.45	524	1960	40	6.5	0 P 226 T	-	275	1790	5
4/9	4-15	0.70	312	0.45	555	2080	42	6.1	0 P 221 T	-	450	1650	36
4/10	4-16	0.76	340	0.49	496	2030	45	6.5	0 P 213 T	-	450	1950	8
Mean		0.74	330	0.48	532	2100	29	-	- -	L-0.1	250	1850	29
Min.		0.68	306	0.44	377	1500	0	6.1	0 P 96 T	L-0.1	150	1280	5
Max.		0.76	340	0.49	634	2540	49	8.5	0 P 266 T	L-0.1	450	2300	46

Sample Point Number 4, Wood Yard Sewer

Lab. No.	Date 1952	Color ppm	TOTAL SOLIDS						SUSPENDED SOLIDS					
			Total		Volatile		Fixed		Total		Volatile		Fixed	
			ppm	lbs/day	ppm	lbs/day	ppm	lbs/day	ppm	lbs/day	ppm	lbs/day	ppm	lbs/day
4-1	3/17	400	1840	7520	1060	4330	780	3190	688	2810	660	2700	28	110
4-2	3/18	500	1630	6520	1040	4160	590	2360	628	2510	572	2290	56	220
4-3	3/19	400	2210	8490	1620	6230	590	2260	850	3260	750	2880	100	380
4-4	3/20	750	2260	9040	1310	5240	950	3800	740	2960	740	2960	-	-
4-5	3/24	500	2220	9080	1560	6380	660	2700	750	3070	720	2950	30	120
4-6	3/25	750	2290	9160	1400	5600	890	3560	1010	4040	930	3720	80	320
4-7	3/26	750	2290	8980	1400	5490	890	3490	1000	3920	925	3630	75	290
4-8	3/27	500	1870	6860	1110	4070	760	2790	800	2940	760	2790	40	150
4-9	3/31	500	1990	7800	1120	4390	870	3410	835	3270	780	3050	55	220
4-10	4/1	-	-	-	-	-	-	-	-	-	-	-	-	-
4-11	4/2	625	1650	6750	896	3670	754	3080	600	2450	530	2160	70	290
4-12	4/3	600	1700	6940	922	3760	778	3180	620	2530	450	1840	170	690
4-13	4/7	500	2040	8160	1210	4840	830	3320	788	3150	728	2910	60	240
4-14	4/8	600	2110	7910	1280	4800	830	3110	645	2420	585	2200	60	220
4-15	4/9	625	2020	7570	1180	4420	840	3150	612	2290	576	2160	36	130
4-16	4/10	600	2130	8710	1350	5520	780	3190	1200	4910	1180	4830	20	80
Mean		575	2020	7970	1230	4860	790	3110	784	3100	725	2870	59	230
Minimum		400	1630	6520	896	3670	590	2260	600	2290	450	1840	-	-
Maximum		750	2290	9160	1620	6230	950	3800	1200	4910	1180	4830	170	690

Sample Point Number 4A, Pulp Mill White Water to Log Conveyor

Date 1952	Lab. No.	Discharge			B.O.D. 5-day, 20°C		IOD	pH	Acid. or Alk.		Sulfides as S	Lignins & Tannins as Tannic Acid	Corrected Oxygen Consumed (Cr_2O_7)	Chlorides as Cl
		cfs	GPM	MGD	ppm	lb/day	ppm		ppm		ppm	ppm	ppm	ppm
4/7	4A-13	0.74	333	0.48	247	988	15	8.1	3 175	P T	L-0.1	100	670	36
4/8	4A-14	0.70	312	0.45	247	926	24	7.0	0 216	P T	L-0.1	125	733	31
4/9	4A-15	0.70	312	0.45	257	964	17	7.3	0 223	P T	-	150	733	27
4/10	4A-16	0.76	340	0.49	217	888	5	7.5	0 220	P T	-	125	726	29
Mean		0.72	324	0.47	242	942	15	-	- -	- -	L-0.1	125	716	31
Min.		0.70	312	0.45	217	888	5	7.0	0 175	P T	L-0.1	100	670	27
Max.		0.76	340	0.49	257	988	24	8.1	3 223	P T	L-0.1	150	733	36

Sample Point Number 4A, Pulp Mill White Water to Log Conveyor

Lab. No.	Date 1952	Color ppm	TOTAL SOLIDS						SUSPENDED SOLIDS					
			Total		Volatile		Fixed		Total		Volatile		Fixed	
			ppm	lbs/day	ppm	lbs/day	ppm	lbs/day	ppm	lbs/day	ppm	lbs/day	ppm	lbs/day
4A-13	4/7	400	1210	4840	400	1600	810	3240	144	576	124	496	20	80
4A-14	4/8	400	1240	4650	524	1970	716	2680	148	555	112	420	36	135
4A-15	4/9	500	1250	4690	454	1710	796	2980	164	615	152	570	12	45
4A-16	4/10	500	1260	5150	498	2030	762	3120	160	654	160	654	-	-
Mean		450	1240	4830	469	1830	771	3000	154	600	137	535	17	65
Minimum		400	1210	4650	400	1600	716	2680	144	555	112	420	-	-
Maximum		500	1260	5150	524	2030	810	3240	164	654	160	654	36	135

Sample Point Number 5, Pulp Mill Surface Ditch

Date 1952	Lab. No.	Discharge			B.O.D. 5-day, 20°C		IOD	pH	Acid. or Alk.	Sulfides as S	Lignin & Tannins as Tannic Acid	Color
		cfs	GPM	MGD	ppm	lb/day	ppm		ppm	ppm	ppm	ppm
3/17	5-1	0.19	83	0.12	514	514	56	10.1	144 P 453 T	0.8	300	2000
3/18	5-2	0.17	76	0.11	530	488	66	10.0	176 P 486 T	3.0	500	3500
3/19	5-3	0.26	118	0.17	548	778	60	10.1	153 P 451 T	9.0	700	3500
3/20	5-4	0.22	91	0.14	406	475	70	10.2	114 P 330 T	3.0	150	1750
3/24	5-5	0.19	83	0.12	456	456	35	10.1	176 P 390 T	2.5	500	2500
3/25	5-6	0.29	132	0.19	532	840	22	10.3	208 P 442 T	4.8	450	3000
3/26	5-7	0.31	139	0.20	353	590	33	7.4	0 P 253 T	1.1	200	1000
3/27	5-8	0.25	111	0.16	282	375	32	7.8	0 P 328 T	2.3	150	1250
3/31	5-9	0.29	132	0.19	428	676	41	8.5	0 P 432 T	2.0	350	2500
4/1	5-10	0.17	76	0.11	-	-	-	-	- - - -	2.3	-	-
4/2	5-11	0.17	76	0.11	297	272	9	8.2	10 P 301 T	1.5	250	1500
4/3	5-12	0.22	97	0.14	366	428	21	9.3	102 P 388 T	2.5	500	1500
4/7	5-13	0.15	69	0.10	-	-	-	-	- - - -	-	-	-
4/8	5-14	0.09	42	0.06	-	-	-	-	- - - -	-	-	-
4/9	5-15	0.11	49	0.07	-	-	-	-	- - - -	-	-	-
4/10	5-16	0.12	56	0.08	-	-	-	-	- - - -	-	-	-
Mean		0.20	90	0.13	428	554	40	-	- - - -	2.9	370	2180
Min.		0.09	42	0.06	282	272	9	10.3	0 P 253 T	0.8	150	1000
Max.		0.31	139	0.20	548	840	70	7.4	208 P 486 T	9.0	700	3500

Sample Point Number 5, Pulp Mill Surface Ditch

Lab. No.	Date 1952	TOTAL SOLIDS						SUSPENDED SOLIDS					
		Total		Volatile		Fixed		Total		Volatile		Fixed	
		ppm	lbs/day	ppm	lbs/day	ppm	lbs/day	ppm	lbs/day	ppm	lbs/day	ppm	lbs/day
5-1	3/17	2730	2730	1020	1020	1710	1710	224	224	180	180	44	44
5-2	3/18	4120	3790	2210	2030	1910	1760	484	445	372	342	112	103
5-3	3/19	3480	4940	2060	2920	1420	2020	464	659	364	517	100	142
5-4	3/20	1910	2230	620	720	1290	1510	172	201	148	173	24	28
5-5	3/24	2430	2430	1160	1160	1270	1270	480	480	352	352	128	128
5-6	3/25	2880	4550	1140	1800	1740	2750	252	398	184	291	68	107
5-7	3/26	1960	3270	910	1520	1050	1750	576	962	468	782	108	180
5-8	3/27	1520	2020	598	790	922	1230	148	197	120	160	28	37
5-9	3/31	2520	3980	900	1420	1620	2560	240	379	168	265	72	114
5-10	4/1	-	-	-	-	-	-	-	-	-	-	-	-
5-11	4/2	1720	1580	590	540	1130	1040	252	232	144	133	108	99
5-12	4/3	2210	2580	940	1100	1270	1480	340	398	224	262	116	136
Mean		2490	3100	1110	1360	1390	1740	330	416	248	314	82	102
Minimum		1520	1580	590	540	922	1040	148	197	120	133	28	28
Maximum		4120	4940	2200	2920	1910	2750	576	962	468	782	128	180

Sample Point Number 6, Old Caustic Room Sewer, New Caustic Room Sewer and Mud Filter Room Sewer (Composited Sample)

Date 1952	Lab. No.	Discharge			B.O.D. 5-day, 20°C		IOD	pH	Acid. or Alk.	Sulfides as S
		cfs	GPM	MGD	ppm	lb/day	ppm		ppm	ppm
3/17	6-1	0.070	31.6	0.045	338	128	306	12.3	2040 P 2980 T	180
3/18	6-2	0.103	46.5	0.067	674	377	440	12.7	5730 P 6230 T	440
3/19	6-3	0.078	35.1	0.051	497	209	350	12.5	2730 P 4030 T	200
3/20	6-4	0.086	38.5	0.055	463	213	173	12.0	1120 P 1740 T	75
3/24	6-5	0.069	31.1	0.045	352	134	135	12.2	1470 P 2020 T	140
3/25	6-6	0.110	49.7	0.072	537	322	460	12.3	3430 P 5580 T	280
3/26	6-7	0.063	28.3	0.041	690	235	1270	12.5	6540 P 10700 T	900
3/27	6-8	0.059	26.6	0.038	349	112	148	12.1	1410 P 1960 T	90
3/31	6-9	0.285	127.9	0.184	308	471	63	11.5	624 P 980 T	25
4/1	6-10	0.075	33.7	0.048	-	-	-	-	- - - -	25
4/2	6-11	0.109	49.0	0.071	164	97	77	11.8	800 P 1140 T	70
4/3	6-12	0.056	24.9	0.036	184	55	84	12.0	934 P 1270 T	70
Mean		0.097	43.6	0.063	414	214	319	-	- - - -	208
Min.		0.056	24.9	0.036	164	55	63	11.5	624 P 980 T	25
Max.		0.285	127.9	0.184	690	471	1270	12.7	6540 P 10700 T	900

Sample Point Number 6, Old Caustic Room Sewer, New Caustic Room Sewer and Mud Filter Room Sewer (Composite Sample)

Lab. No.	Date 1952	TOTAL SOLIDS						SUSPENDED SOLIDS					
		Total		Volatile		Fixed		Total		Volatile		Fixed	
		ppm	lbs/day	ppm	lbs/day	ppm	lbs/day	ppm	lbs/day	ppm	lbs/day	ppm	lbs/day
6-1	3/17	5540	2100	930	350	4610	1750	1010	384	480	183	530	201
6-2	3/18	10100	5660	1290	730	8810	4930	1860	1040	820	460	1040	580
6-3	3/19	6220	2610	1280	540	4940	2070	544	228	300	126	244	102
6-4	3/20	4820	2220	1220	560	3600	1660	968	445	576	265	392	180
6-5	3/24	3810	1450	900	350	2910	1100	528	201	328	125	200	76
6-6	3/25	8140	4880	610	360	7530	4520	592	355	340	204	252	151
6-7	3/26	15600	5300	1450	490	14150	4810	1070	364	630	214	440	150
6-8	3/27	3760	1200	580	180	3180	1020	452	145	220	71	232	74
6-9	3/31	3030	4640	940	1440	2090	3200	648	991	424	648	224	343
6-10	4/1	-	-	-	-	-	-	-	-	-	-	-	-
6-11	4/2	2410	1420	366	220	2040	1190	308	182	160	95	148	87
6-12	4/3	2610	783	750	225	1860	558	340	102	176	53	164	49
Mean		6000	2930	940	490	5060	2440	756	403	405	222	351	181
Minimum		2410	783	366	180	1860	558	308	102	160	53	148	49
Maximum		15600	5660	1450	1440	14150	4930	1860	1040	820	650	1040	580

Sample Point Number 9, Total Pulp Mill Effluent

Date 1952	Lab. No.	Discharge			B.O.D. 5-day 20°C		IOD	pH	Acid. or Alk.	Sulfides as S	Lignins & Tannins as Tannic Acid	Corrected Oxygen Consumed (Cr_2O_7)	Chlorides as Cl	Color
		cfs	GPM	MGD	ppm	lb/day	ppm		ppm	ppm	ppm	ppm	ppm	ppm
3/17	9-1	10.5	4700	6.77	427	24100	20	10.3	140 P 354 T	8.5	175	1700	19	1500
3/18	9-2	10.8	4830	6.96	349	20200	20	9.9	38 P 274 T	3.0	110	1060	9	600
3/19	9-3	11.4	5120	7.37	333	20500	0	9.5	38 P 235 T	3.0	110	1070	9	625
3/20	9-4	11.4	5120	7.37	407	25000	28	9.9	67 P 243 T	2.5	80	1090	13	500
3/24	9-5	10.8	4830	6.96	449	26100	18	9.6	71 P 270 T	6.0	175	1320	18	750
3/25	9-6	11.0	4920	7.08	386	22800	26	10.5	225 P 448 T	2.0	122	1030	21	750
3/26	9-7	12.1	5420	7.80	346	22500	18	8.3	1 P 243 T	5.0	125	998	16	625
3/27	9-8	11.8	5280	7.60	474	30000	49	8.3	10 P 420 T	5.0	210	-	-	2000
3/31	9-9	12.3	5500	7.92	368	24300	10	7.3	0 P 201 T	2.0	110	947	-	600
4/1	9-10	10.2	4580	6.59	-	-	-	-	- - - -	2.0	-	864	6	750
4/2	9-11	10.2	4580	6.59	389	21400	0	9.5	76 P 296 T	6.5	145	1030	10	1000
4/3	9-12	10.4	4670	6.72	384	21500	19	8.5	21 P 256 T	9.0	155	896	11	625
4/7	9-13	11.0	4920	7.08	337	19900	27	8.1	10 P 228 T	2.0	132	903	5	500
4/8	9-14	11.1	4960	7.14	340	20200	26	7.5	0 P 310 T	5.0	140	927	10	500
4/9	9-15	11.0	4920	7.08	444	26200	37	9.0	42 P 462 T	11.0	375	1390	14	1500
4/10	9-16	10.2	4580	6.59	312	17100	18	8.1	13 P 306 T	6.0	138	945	7	625
Mean		11.0	4930	7.10	383	22800	21	-	- - - -	4.9	153	1080	12	840
Min.		10.2	4580	6.59	312	17100	0	7.3	0 P 201 T	2.0	80	864	5	500
Max.		12.3	5500	7.92	474	30000	49	10.5	225 P 462 T	11.0	375	1700	21	2000

Sample Point Number 9, Total Pulp Mill Effluent

Lab No.	Date 1952	TOTAL SOLIDS						SUSPENDED SOLIDS					
		Total		Volatile		Fixed		Total		Volatile		Fixed	
		ppm	lbs/day	ppm	lbs/day	ppm	lbs/day	ppm	lbs/day	ppm	lbs/day	ppm	lbs/day
9-1	3/17	2050	116000	800	45400	1250	70600	184	10400	176	9950	8	450
9-2	3/18	1520	88200	616	35700	904	52500	212	12300	180	10400	32	1900
9-3	3/19	1520	93400	712	43800	808	49600	256	15700	216	13440	40	2460
9-4	3/20	1510	92800	460	28300	1050	64500	208	12800	208	12800	-	-
9-5	3/24	1840	107000	710	41400	1130	65600	252	14600	252	14600	-	-
9-6	3/25	1800	106000	470	27500	1330	78500	168	9920	136	8030	32	1890
9-7	3/26	1580	103000	596	39000	984	64000	168	10900	156	10100	12	800
9-8	3/27	2160	137000	660	41900	1500	95100	200	12700	200	12700	-	-
9-9	3/31	1530	101000	420	27700	1110	73300	180	11900	164	10800	16	1100
9-10	4/1	1550	85200	290	16000	1260	69200	224	12300	196	10800	28	1500
9-11	4/2	1580	86800	450	24700	1130	62100	156	8570	128	7070	28	1500
9-12	4/3	1520	85200	560	31400	960	53800	216	12100	188	10530	28	1570
9-13	4/7	1540	90900	440	25900	1100	65000	180	10600	144	8480	36	2120
9-14	4/8	1440	85800	582	34700	858	51100	192	11400	144	8540	48	2860
9-15	4/9	2000	118000	700	41200	1300	76800	168	9920	156	9210	12	710
9-16	4/10	1500	82400	600	32900	900	49500	200	11000	196	10800	4	200
Mean		1660	98700	560	33600	1100	65100	198	11700	178	10510	20	1190
Minimum		1440	82400	290	16000	808	49500	156	8570	128	7070	-	-
Maximum		2160	137000	800	45400	1500	95100	256	15700	252	14600	48	2860

Sample Point Number 9A, Recovery Room Effluent

Date 1952	Lab. No.	Discharge			B.O.D. 5-day, 20°C		IOD	pH	Acid. or Alk.	Sulfides as S	Lignins & Tannins as Tannic Acid	Corrected Oxygen Consumed (Cr_2O_7)	Chlorides as Cl
		cfs	GPM	MGD	ppm	lb/day	ppm		ppm	ppm	ppm	ppm	
3/17	9A-1	0.39	175	0.25	2340	4870	275	11.5	340 P 636 T	120	2000	10100	140
3/18	9A-2	0.36	162	0.23	337	647	90	11.1	634 P 1220 T	60	275	1250	85
3/19	9A-3	0.36	162	0.23	427	820	23	11.0	404 P 742 T	33	275	1190	60
3/20	9A-4	0.49	220	0.32	400	1070	80	11.4	282 P 916 T	45	100	1290	58
3/24	9A-5	0.27	121	0.17	420	596	70	11.3	740 P 1260 T	55	500	1760	72
3/25	9A-6	0.33	148	0.21	880	1540	260	12.1	2060 P 3360 T	95	650	2210	185
3/26	9A-7	0.37	166	0.24	840	1680	230	11.3	988 P 1600 T	70	1100	3660	155
3/27	9A-8	0.39	175	0.25	1810	3760	510	11.5	2070 P 3310 T	45	2000	8050	285
3/31	9A-9	0.31	139	0.20	1170	1960	140	10.7	922 P 1820 T	1	2000	5330	110
4/1	9A-10	0.37	166	0.24	-	-	-	-	- -	25	-	-	-
4/2	9A-11	0.37	166	0.24	440	880	148	12.2	1766 P 2640 T	120	500	1360	124
4/3	9A-12	0.37	166	0.24	802	1600	420	12.2	2588 P 4412 T	210	1500	2430	120
Mean		0.36	164	0.24	897	1770	204	-	- -	73	991	3510	127
Min.		0.27	121	0.17	337	596	23	10.7	282 P 636 T	1	100	1190	58
Max.		0.49	220	0.32	2340	4870	510	12.2	2588 P 4412 T	210	2000	10100	285

Sample Point Number [illegible]

Lab. No.	Date 1952	Color ppm	TOTAL SOLIDS						SUSPENDED SOLIDS					
			Total		Volatile		Fixed		Total		Volatile		Fixed	
			ppm	lbs/day	ppm	lbs/day	ppm	lbs/day	ppm	lbs/day	ppm	lbs/day	ppm	lbs/day
9A-1	3/17	17500	13600	28300	5680	11800	7920	16500	240	500	204	425	36	75
9A-2	3/18	1750	3960	760	1120	2150	2840	5450	268	514	172	330	96	184
9A-3	3/19	1750	2640	5070	990	1900	1650	3170	228	438	180	346	48	92
9A-4	3/20	1500	3050	8140	650	1730	2400	6410	244	651	224	598	20	53
9A-5	3/24	3000	4160	5910	1210	1720	2950	4190	372	528	348	494	24	34
9A-6	3/25	5000	6970	12200	1070	1900	5900	10300	240	420	160	280	80	140
9A-7	3/26	8000	5990	12000	2110	4240	3680	7760	196	392	152	304	44	88
9A-8	3/27	17500	11800	24500	4310	8900	7490	15600	260	541	200	416	60	125
9A-9	3/31	8750	8500	14200	3780	6320	4720	7880	228	381	168	281	60	100
9A-10	4/1	-	-	-	-	-	-	-	-	-	-	-	-	-
9A-11	4/2	2500	5020	10000	640	1280	4380	8760	204	408	136	272	68	136
9A-12	4/3	5000	8250	16500	1500	3000	6750	13500	192	384	148	296	44	88
Mean		6570	6720	13130	2100	4080	4620	9050	243	469	190	368	53	101
Minimum		1500	2640	5070	640	1280	1650	3170	192	381	136	272	20	34
Maximum		17500	13600	28300	5680	11800	7920	16500	372	650	348	598	96	184

Sample Point Number 9B, Turpentine Separator Underflow

Date 1952	Lab. No.	Discharge			B.O.D. 5-day, 20°C		IOD	pH	Acid. or Alk.	Sulfides as S	Lignins & Tannins as Tannic Acid	Corrected Oxygen Consumed (Cr_2O_7)	Chlorides as Cl
		cfs	GPM	MGD	ppm	lb/day	ppm		ppm	ppm	ppm	ppm	ppm
-/7	9B-13	0.097	43.5	0.063	6280	3270	340	9.9	610 P 762 T	95	5000	7310	1000
-/8	9B-14	0.089	39.9	0.057	5680	2730	310	9.8	610 P 721 T	80	145	6920	1490
-/9	9B-15	0.089	40.0	0.058	5930	2850	150	10.1	646 P 771 T	60	420	7120	1480
-/10	9B-16	0.084	37.8	0.054	5910	2660	130	10.0	648 P 811 T	60	400	7150	1420
Mean		0.090	40.3	0.058	5950	2880	232	-	- - - -	74	1490	7120	1350
Min.		0.084	37.8	0.054	5680	2660	130	9.8	610 P 721 T	60	145	6920	1000
Max.		0.097	43.5	0.063	6280	3270	340	10.1	648 P 811 T	95	5000	7310	1490

Sample Point Number 9B, Turpentine Separator Underflow

Lab. No.	Date 1952	Color ppm	TOTAL SOLIDS						SUSPENDED SOLIDS					
			Total		Volatile		Fixed		Total		Volatile		Fixed	
			ppm	lbs/day	ppm	lbs/day	ppm	lbs/day	ppm	lbs/day	ppm	lbs/day	ppm	lbs/day
9B-13	4/7	350	2390	1240	570	294	1820	946	16	8	10	5	6	3
9B-14	4/8	300	3020	1450	870	420	2150	1030	8	4	5	3	3	1
9B-15	4/9	300	3200	1540	810	390	2390	1160	8	4	8	4	-	-
9B-16	4/10	300	3030	1360	810	360	2220	1000	6	3	6	3	-	-
Mean		310	2910	1400	770	370	2140	1030	10	5	8	4	2	1
Minimum		300	2390	1240	570	294	1820	946	6	3	5	3	-	-
Maximum		350	3200	1540	870	420	2390	1160	16	8	10	5	6	3

Sample Point Number 1C Crude Tall Oil Plant and Cinder Pond Effluent

Date 1952	Lab. No.	Discharge			B.O.D. 5-day, 20°C		IOD	pH	Acid. or Alk.	Sulfides as S	Corrected Oxygen Consumed (Cr_2O_7)	Chlorides as Cl	Color
		cfs	GPM	MGD	ppm	lb/day	ppm		ppm	ppm	ppm	ppm	ppm
3/17	10-1	0.258	116	0.167	187	260	16	5.9	0 P 22 T	L-0.1	-	-	-
3/18	10-2	0.344	154	0.222	320	592	14	6.2	0 P 34 T	0.3	-	-	-
3/19	10-3	0.252	113	0.163	199	271	12	6.3	0 P 62 T	0.5	-	-	-
3/20	10-4	0.362	162	0.234	257	501	18	6.0	0 P 35 T	0.1	-	-	-
3/24	10-5	0.407	183	0.263	499	1090	14	5.0	- - - -	L-0.1	-	-	-
3/25	10-6	0.323	145	0.209	388	675	6	5.0	- - - -	L-0.1	-	-	-
3/26	10-7	0.236	106	0.152	302	384	13	6.3	0 P 40 T	0.5	625	55	250
3/27	10-8	0.319	143	0.206	307	528	13	6.0	0 P 44 T	L-0.1	645	68	250
3/31	10-9	0.592	266	0.382	301	957	14	6.2	0 P 47 T	0.3	653	58	250
4/1	-10	0.392	176	0.253	-	-	-	-	- - - -	0.4	652	67	250
4/2	-11	0.275	123	0.178	228	337	0	6.4	0 P 48 T	0.9	501	82	-
4/3	-12	0.259	116	0.167	199	277	7	6.4	0 P 44 T	0.8	457	84	-
4/7	-13	0.253	114	0.163	233	317	13	7.0	0 P 116 T	0.3	599	68	150
4/8	-14	0.270	121	0.174	230	334	13	6.9	0 P 116 T	0.5	627	66	200
4/9	-15	0.316	142	0.204	265	450	15	6.3	0 P 99 T	0.3	745	78	200
4/10	-16	0.282	127	0.182	253	384	11	6.5	0 P 92 T	0.8	734	106	200
Mean		0.321	144	0.207	278	490	12	-	- - - -	-	624	73	220
Min.		0.236	106	0.152	187	260	0	5.0	0 P 22 T	L-0.1	457	55	150
Max.		0.592	266	0.382	499	1090	18	7.0	0 P 116 T	0.9	745	106	250

Sample Point Number 10, Crude Tall Oil Plant and Cinder Pond Effluent

Lab. No.	Date 1952	TOTAL SOLIDS						SUSPENDED SOLIDS					
		Total		Volatile		Fixed		Total		Volatile		Fixed	
		ppm	lbs/day	ppm	lbs/day	ppm	lbs/day	ppm	lbs/day	ppm	lbs/day	ppm	lbs/day
10-1	3/17	-	-	-	-	-	-	45	63	36	51	9	12
10-2	3/18	-	-	-	-	-	-	225	416	193	357	32	59
10-3	3/19	-	-	-	-	-	-	101	137	88	119	13	18
10-4	3/20	-	-	-	-	-	-	46	90	41	80	5	10
10-5	3/24	-	-	-	-	-	-	91	199	83	182	8	17
10-6	3/25	-	-	-	-	-	-	43	75	36	63	7	12
10-7	3/26	6040	7670	580	740	5460	6930	48	61	30	38	18	23
10-8	3/27	5600	9630	670	1150	4930	8480	68	117	54	93	14	24
10-9	3/31	5360	17000	670	2100	4690	14900	98	312	75	239	23	73
10-10	4/1	7430	15700	460	1000	6970	14700	51	108	40	85	11	23
10-11	4/2	5700	8440	500	740	5200	7700	52	77	35	52	17	25
10-12	4/3	4870	6770	380	530	4490	6240	51	71	32	45	19	26
10-13	4/7	3810	5180	490	660	3320	4520	69	94	42	57	27	37
10-14	4/8	3690	5350	510	740	3180	4610	47	68	30	43	17	25
10-15	4/9	4150	7060	540	920	3610	6140	38	65	31	53	7	12
10-16	4/10	3800	5780	520	800	3280	4980	58	88	48	73	10	15
Mean		5040	8860	532	940	4510	7920	71	128	56	102	15	26
Minimum		3690	5170	380	530	3180	4520	38	61	30	38	5	10
Maximum		7430	17000	670	2100	6970	14900	225	416	193	357	32	73

Sample Point Number 10A, Crude Tall Oil Plant Pond Influent

Date 1952	Lab. No.	Discharge			B.O.D. 5-day, 20°C		IOD	pH	Acid. or Alk.	Sulfides as S	Lignins & Tannins as Tannic Acid	Corrected Oxygen Consumed (Cr_2O_7)	Chlorides as Cl
		cfs	GPM	MGD	ppm	lb/day	ppm		ppm	ppm	ppm	ppm	ppm
4/7	10A-13	0.059	26	0.038	2380	762	145	3.3	85 MO 308 T	0.1	800	4990	418
4/8	10A-14	0.092	41	0.059	2600	1270	165	3.5	86 MO 332 T	L-0.1	900	7300	94
4/9	10A-15	0.143	64	0.092	2900	2230	140	3.6	80 MO 286 T	L-0.1	1500	11600	510
4/10	10A-16	0.104	47	0.068	1880	1070	110	4.0	49 MO 204 T	L-0.1	1000	4510	99
Mean		0.100	44	0.064	2440	1340	140	-	- - - -	-	1050	7100	280
Min.		0.059	26	0.038	1880	762	110	3.3	49 MO 204 T	L-0.1	800	4510	94
Max.		0.143	64	0.092	2900	2230	165	4.0	86 MO 332 T	0.1	1500	11600	510

Sample Point Number 10A, Crude Tall Oil Plant Pond Influent

Lab. No.	Date 1952	Color ppm	TOTAL SOLIDS						SUSPENDED SOLIDS					
			Total		Volatile		Fixed		Total		Volatile		Fixed	
			ppm	lbs/day	ppm	lbs/day	ppm	lbs/day	ppm	lbs/day	ppm	lbs/day	ppm	lbs/day
10A-13	4/7	300	11300	3620	2800	900	8500	2720	1780	570	1760	564	20	6
10A-14	4/8	400	10300	5050	5160	2530	5140	2520	2800	1370	2760	1350	40	20
10A-15	4/9	400	11200	8620	5340	4110	5860	4510	3060	2360	3030	2340	30	20
10A-16	4/10	600	5490	3130	2030	1160	3460	1970	1170	667	1170	667	-	-
Mean		425	9570	5100	3830	2170	5740	2930	2200	1240	2180	1230	20	10
Minimum		300	5490	3130	2030	900	3460	1970	1170	570	1170	564	-	-
Maximum		600	11300	8620	5340	4110	8500	4510	3060	2360	3030	2340	40	20

Sample Point Number 10B, Crude Tall Oil Plant Pond Effluent

Date 1952	Lab. No.	Discharge			B.O.D. 5-day, 20°C		IOD	pH	Acid. or Alk.	Sulfides as S	Lignins & Tannins as Tannic Acid	Corrected Oxygen Consumed (Cr_2O_7)	Chlorides as Cl
		cfs	GPM	MGD	ppm	lb/day	ppm		ppm	ppm	ppm	ppm	ppm
4/7	10B-13	0.059	26	0.038	830	266	90	4.0	40 MO 174 T	L-0.1	1000	2110	150
4/8	10B-14	0.092	41	0.059	970	475	90	4.0	38 MO 220 T	L-0.1	1000	2550	126
4/9	10B-15	0.143	64	0.092	897	691	53	4.1	32 MO 226 T	L-0.1	1000	2510	173
4/10	10B-16	0.104	47	0.068	667	380	187	4.1	42 MO 228 T	L-0.1	1200	2320	217
Mean		0.100	44	0.064	841	453	105	-	- - - -	L-0.1	1050	2370	166
Min.		0.059	26	0.036	667	266	53	4.0	32 MO 174 T	L-0.1	1000	2110	126
Max.		0.143	64	0.092	970	691	187	4.1	42 MO 228 T	L-0.1	1200	2550	217

Sample Point Number 10B, Crude Tall Oil Plant Pond Effluent

Lab. No.	Date 1952	Color ppm	TOTAL SOLIDS						SUSPENDED SOLIDS					
			Total		Volatile		Fixed		Total		Volatile		Fixed	
			ppm	lbs/day	ppm	lbs/day	ppm	lbs/day	ppm	lbs/day	ppm	lbs/day	ppm	lbs/day
10B-13	4/7	400	10600	3390	1370	440	9230	2950	150	48	138	44	12	4
10B-14	4/8	500	10300	5050	1470	720	8830	4330	1400	686	1400	686	-	-
10B-15	4/9	350	9710	7480	1560	1200	8150	6280	1270	978	1260	970	10	8
10B-16	4/10	400	8840	5040	1360	780	7480	4240	318	181	318	181	-	-
Mean		410	9860	5240	1440	790	8420	4450	784	474	779	471	5	3
Minimum		350	8840	3390	1360	440	7480	2950	150	48	138	44	-	-
Maximum		500	10600	7480	1560	1200	9230	6280	1400	978	1400	970	12	8

Measuring Point Number 10C, Cinder Point Influent

Lab. No.	Date 1952	Discharge		
		cfs	GPM	MGD
10C-13	4/7	0.194	87.0	0.125
10C-14	4/8	0.178	79.8	0.115
10C-15	4/9	0.173	77.7	0.112
10C-16	4/10	0.178	80.0	0.115
Mean		0.181	81.1	0.117
Minimum		0.173	77.7	0.112
Maximum		0.194	87.0	0.125

Sample Point Number 11, Paper Mill Effluent

Date 1952	Lab. No.	Discharge			B.O.D. 5-day, 20°C		IOD	pH	Acid. or Alk.		Sulfides as S	Lignins & Tannins as Tannic Acid	Corrected Oxygen Consumed (Cr_2O_7)	Chlorides as Cl
		cfs	GPM	MGD	ppm	lb/day	ppm		ppm		ppm	ppm	ppm	ppm
3/18	11-2	8.0	3590	5.2	111	4810	0	6.8	0	P	L-0.1	15	669	35
									92	T				
3/19	11-3	5.0	2240	3.2	150	4000	0	6.8	0	P	L-0.1	15	551	30
									92	T				
3/20	11-4	7.5	3370	4.8	121	4840	0	6.8	0	P	0.3	15	533	31
									78	T				
3/24	11-5	6.5	2920	4.2	104	3640	0	7.0	0	P	L-0.1	17	363	28
									73	T				
3/25	11-6	6.5	2920	4.2	126	4410	0	7.2	0	P	L-0.1	11	459	31
									73	T				
3/26	11-7	4.5	2020	2.9	99	2390	0	6.9	0	P	L-0.1	15	392	39
									81	T				
3/27	11-8	5.0	2240	3.2	136	3630	2	6.9	0	P	L-0.1	12	549	245
									81	T				
3/31	11-9	6.0	2690	3.9	176	5720	5	7.5	0	P	6	80	751	12
									150	T				
4/1	11-10	8.0	3590	5.2	-	-	-	-	-	-	L-0.1	-	-	-
									-	-				
4/2	11-11	6.0	2690	3.9	124	4030	0	6.9	0	P	L-0.1	15	415	38
									68	T				
4/3	11-12	6.0	2690	3.9	137	4460	0	6.9	0	P	L-0.1	15	453	40
									65	T				
4/7	11-13	5.3	2380	3.4	-	-	-	-	-	-	-	-	-	-
									-	-				
4/8	11-14	6.7	3010	4.3	-	-	-	-	-	-	-	-	-	-
									-	-				
4/9	11-15	6.1	2740	3.9	-	-	-	-	-	-	-	-	-	-
									-	-				
4/10	11-16	5.4	2420	3.5	-	-	-	-	-	-	-	-	-	-
									-	-				
Mean		6.2	2770	4.0	128	4190	0.7	-	-	-	-	22	514	53
									-	-				
Min.		4.5	2020	2.9	99	2390	0	6.8	0	P	L-0.1	11	363	12
									65	T				
Max.		8.0	3590	5.2	176	5720	5	8.0	0	P	6	80	751	245
									150	T				

Sample Point Number 11, Paper Mill Effluent

Lab. No.	Date 1952	Color ppm	TOTAL SOLIDS						SUSPENDED SOLIDS					
			Total		Volatile		Fixed		Total		Volatile		Fixed	
			ppm	lbs/day	ppm	lbs/day	ppm	lbs/day	ppm	lbs/day	ppm	lbs/day	ppm	lbs/day
11-2	3/18	15	994	43100	488	21200	506	21900	395	17100	395	17100	-	-
11-3	3/19	60	942	25100	490	13000	452	12100	305	8140	290	7740	15	400
11-4	3/20	60	1050	42000	356	14200	694	27800	260	10400	255	10200	5	200
11-5	3/24	60	874	30600	292	10200	582	20400	170	5960	170	5960	-	-
11-6	3/25	80	972	34000	320	11200	652	22800	230	8060	215	7530	15	530
11-7	3/26	60	912	22100	322	7800	590	14300	210	5080	195	4720	15	360
11-8	3/27	40	1440	38400	390	10400	1050	28000	295	7870	285	7600	10	270
11-9	3/31	-	1240	40300	472	15300	768	25000	240	7810	215	7000	25	810
11-10	4/1	-	-	-	-	-	-	-	-	-	-	-	-	-
11-11	4/2	60	910	29600	218	7100	692	22500	205	6670	195	6350	10	320
11-12	4/3	30	1010	32800	378	12200	632	20600	300	9760	270	8780	30	980
Mean		52	1030	33800	368	12300	662	21500	261	8680	249	8290	12	390
Minimum		15	874	22100	218	7100	452	12100	170	5080	170	4720	-	-
Maximum		80	1440	43100	490	21200	1050	28000	395	17100	395	17100	30	980

Sample Point Number 12, Salt Water Mill Influent

Lab. No.	Date 1952	Discharge			B.O.D. 5-day, 20°C.		pH	Acid. or Alk. ppm	Sulfides as S ppm	Chlorides as Cl ppm	Color ppm
		cfs	GPM	MGD	ppm	lbs/day					
12-1	3/17	30.8	13800	19.9	3.83	636	7.8	0 P 83 T	L-0.1	14800	20
12-2	3/18	33.3	14900	21.5	1.32	237	7.6	0 P 82 T	L-0.1	13300	30
12-3	3/19	34.3	15400	22.2	0.64	118	7.8	0 P 62 T	L-0.1	14900	15
12-4	3/20	31.0	14000	20.1	0.66	111	7.7	0 P 81 T	L-0.1	14700	20
12-5	3/24	39.4	17700	25.5	0.75	160	7.5	0 P 76 T	-	12600	20
12-13	4/7	36.2	16200	23.4	2.17	423	6.5	0 P 66 T	-	11000	40
12-14	4/8	37.1	16700	24.0	1.32	264	8.0	0 P 67 T	-	10400	40
12-15	4/9	38.5	17300	24.9	1.63	339	7.5	0 P 65 T	-	9440	40
12-16	4/10	38.7	17400	25.0	1.59	332	7.2	0 P 57 T	-	6980	40
Mean		35.5	15900	22.9	1.55	291	-	-	L-0.1	12000	30
Min.		30.8	13800	19.9	0.64	111	6.5	0 P 57 T	L-0.1	6980	15
Max.		39.4	17700	25.5	3.83	636	8.0	0 P 83 T	L-0.1	14900	40

Sample Point Number 12, Salt Water Mill Influent

Lab. No.	Date 1952	TOTAL SOLIDS						SUSPENDED SOLIDS					
		Total		Volatile		Fixed		Total		Volatile		Fixed	
		ppm	lbs/day	ppm	lbs/day	ppm	lbs/day	ppm	lbs/day	ppm	lbs/day	ppm	lbs/day
12-1	3/17	31400	5210000	8160	1350000	23240	3860000	9	1490	7	1160	2	330
12-2	3/18	29000	5200000	8440	1510000	20560	3690000	13	2330	5	900	8	1430
12-3	3/19	29000	5370000	6680	1240000	22320	4130000	16	2960	8	1480	8	1480
12-4	3/20	11100	1860000	8240	1380000	2860	480000	3	503	3	503	-	-
12-5	3/24	26000	5530000	5500	1170000	20500	4360000	6	1280	6	1280	-	-
12-13	4/7	26000	5070000	8860	1730000	17140	3340000	12	2340	7	1360	5	980
12-14	4/8	22500	4500000	11900	2380000	10600	2120000	7	1400	5	1000	2	400
12-15	4/9	19500	4050000	4660	970000	14840	3080000	10	2070	6	1240	4	830
12-16	4/10	16100	3360000	4890	1020000	11210	2340000	8	1670	6	1250	2	420
Mean		23400	4460000	7500	1420000	15900	3040000	9	1780	6	1130	3	650
Minimum		11100	1860000	4660	970000	2860	480000	3	503	3	503	-	-
Maximum		31400	5530000	11900	2380000	23240	4360000	16	2960	8	1480	8	1480

Sample Point Number 13, Fresh (Well) Water Mill Influent

Lab. No.	Date 1952	Discharge			Chlorides as Cl ppm	pH	Acid. or Alk. ppm	Sulfides as S ppm	Color ppm
		cfs	GPM	MGD					
13-1	3/17	22.1	10000	14.3	-	7.7	0 P 134 T	L-0.1	5
13-2	3/18	22.1	10000	14.3	25	7.6	0 P 129 T	L-0.1	0
13-3	3/19	22.1	10000	14.3	25	7.6	0 P 132 T	L-0.1	5
13-4	3/20	22.1	10000	14.3	29	7.5	0 P 136 T	L-0.1	10
13-5	3/24	22.1	10000	14.3	26	7.4	0 P 132 T	-	5
Mean		22.1	10000	14.3	26	-	-	L-0.1	5
Min.		22.1	10000	14.3	25	7.4	0 P 129 T	L-0.1	0
Max.		22.1	10000	14.3	29	7.7	0 P 136 T	L-0.1	10

Sample Point Number 13, Fresh (Well) Water Mill Influent

Lab. No.	Date 1952	TOTAL SOLIDS					
		Total		Volatile		Fixed	
		ppm	lbs./day	ppm	lbs./day	ppm	lbs./day
13-1	3/17	382	45600	82	9800	300	35800
13-2	3/18	546	65100	208	24800	338	40300
13-3	3/19	234	27900	100	11900	134	16000
13-4	3/20	234	27900	58	6900	176	21000
13-5	3/24	230	27400	138	16400	92	11000
Mean		325	38800	117	14000	208	24800
Min.		230	27400	58	6900	92	11000
Max.		546	65100	208	24800	338	40300